Vol. LXXXVIII. No. 2268. [All rights reserved.] MAY 13, 1921. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.] Price Sixpence.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. 4. Subscription Rates, Postage Free: United Kingdom, £1 14s. 8d. Annually, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum.—New York: D. Van Nostrand Co., 25, Park Place, New York City. Toronto, Ont.: Wm. Dawson & Sons, Ltd., Manning Chambers. Paris: Boyveau & Chevillet, Librairie, Etrangère, 22, Rue de la Banque. Telegraphic Address: "Agecraft, Cent., London." A B C. Code. Telephone Nos.: City 997; Central 4425 (Editorial only).

GENERAL LIBRARY 1921 UNIV. OF MICH.

**LITHOLITE INSULATORS, Ltd.**
65—67, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston, 599, London.
FIREPROOF AND OTHER GRADES.
Established nearly 20 years.

**SILUMINITE**
ELECTRIC INSULATION.
NON-HYGROSCOPIC.
FIREPROOF.
SHEET and MOULDINGS.
'Phone: Southall 59.
THE SILUMINITE INSULATOR Co., Ltd., The Green, Southall, Middlesex.
See Large Advt., p. xxvii.

T. H. FERGUSON, PAILIN, LIMITED. A. C.
**SWITCHBOARDS.**
L. T. EDWARD ST., Nr. Openshaw, MANCHESTER. Tel.: 330 Openshaw. C. D.

INSTRUMENTS, CIRCUIT-BREAKERS,
AUTO-CUT-IN & CUT-OUTS.
**The Record Electrical Co., Ltd.**
BROADHEATH, MANCHESTER.
Telephone: 164 Altrincham.

**BROOK**
ONE, TWO and THREE-PHASE
**MOTORS.**
See Sup. 43.

**SWITCHGEAR.**
**ERNEST F. MOY, LTD.,**
Manufacturing Electrical Engineers and Government Contractors,
GREENLAND PLACE, CAMDEN TOWN, LONDON.

**'Cantie' Switches**
NOTE NEW ADDRESS:
THE "CANTIE" SWITCH CO., LTD.
LEIGHTON STREET,
NOTTINGHAM.

THE **SAXONIA**
ELECTRICAL WIRE CO., LTD.
BRITISH MADE
GREENWICH, S.E.
**FLEXIBLE CABLES**

**CHURTON**
SINGLE and POLYPHASE
**MOTORS.**
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

**Cutting**
Electric Motors.
*See Advt. page xii.*
*Telegrams: Cutting, Stamford. Tel. No. 12.*

**"EMPIRE"**
**AUTOMATIC CONTROL**
FOR
Pumps, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

**WESTERN-ELECTRIC**
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C. 2
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement this week, Sup. 39.

**CONNOLLY'S (BLACKLEY), Ld.**
for
WIRES AND CABLES.
See Advertisement last week, p. iii.

**INSULATING TAPES, WEBS, SLEEVING, &c.**
*Delivery from Stock.*
JOHN MACLENNAN & CO.,
115, Newgate Street, E.C. 1.
And at GLASGOW.

**— STAMPINGS, —**
Tokens, Checks, Blanks, Press Tools, Cutters, Punches, Dies, also Name Plates, Instruction Plates, Meter Dials, Switchboard Labels, Advertising Novelties, Club Badges, Address Plates.
**RELIANCE** Engraving Co., Ltd., CHISWICK.

**JULIUS SAX**
FOR
**BELLS.**
Over 50 years' experience.

**"All there is to it."**
See Sup. 14

**MOTORS. • DYNAMOS.**
**VICTORIA DYNAMO & MOTOR CO.,**
CRAVEN HOUSE,
Kingsway, London, W.C. 2.
'Phone: Gerrard 1245.

**FULLER'S** UNITED ELECTRIC WORKS, LIMITED.
MANUFACTURERS OF
ACCUMULATORS BATTERIES
WIRES & CABLES CARBONS, &c.
WORKS: CHADWELL HEATH, ESSEX.
General Sales Offices:
IDDESLEIGH HOUSE, Caxton St., Westminster.
'Grams: Bleobat, Vic. London. 'Phone: Victoria 6855.

**MAVOR & COULSON, Ltd.,**
GLASGOW.
**MOTORS, DYNAMOS, SWITCHGEAR.**

**IF IT MUST BE**
RUSTLESS
MAKE IT OF
ALUMINIUM
*British Aluminium Co., Ltd., 109, Queen Victoria St., London.*

**RAYNER & HEALD, LTD.,**
DUKE STREET, DERBY.
***TWO & THREE-PHASE MOTORS only.***

**CONTINUOUS CONTROL of COAL CONSUMPTION**
BY MEANS OF THE
**LEA COAL METER**
for Chain Grate Stokers.
*Ask for Leaflet K C.M.*
The LEA RECORDER Co., Ltd., 28, Deansgate, Manchester.

"Increased means and increased leisure are the two civilisers of man."—*Disraeli.*
**Use M.E.M. Gear**
and secure both.
*See page xi.*

*Advertisement Index, see page xxxvi.*

# VERTICAL ENCLOSED HIGH SPEED STEAM ENGINES.

For direct coupling to Dynamos, Pumps, Fans, &c.

Early Delivery of 5, 7½, 10 & 20 KW. Sets for 110 Volts.

SIMPLE AND COMPOUND.

For Ship Lighting and Industrial Works of all kinds.

*Also*

VERTICAL MULTI-CYLINDER GAS ENGINES.

## E. S. HINDLEY & SONS,

11, Queen Victoria Street, E.C. 4.

Works: BOURTON, DORSET.

Telephone: City 9804.
Telegrams: "Steamport, Cannon."

# WESTOOL
## ELECTRIC PORTABLE TOOLS.

*DELIVERIES FROM STOCK.*

No. 1 size, Mark 1 **DRILL** for 9/16" holes, 110 volts and 220 volts, D.C. ***(Leaflet No. 95.)***

No. 3 size, Mark 1 **DRILL** for 1¼" holes, 110 volts and 220 volts, D.C. ***(Leaflet No. 90.)***

**ELECTRIC PORTABLE BLOWER,** 110 volts and 220 volts, D.C. & A.C. ***(Leaflet No. 92.)***

*Write for Prices and Leaflets.*

THE
## WESTMINSTER TOOL & ELECTRIC CO.

WESTOOL WORKS,
**Putney Bridge Road, Putney,**
**LONDON, S.W. 15.**
Telephone: PUT. 1179.

# MICA & MICANITE

INSULATORS FOR EVERY DESCRIPTION OF ELECTRICAL WORK.
Contractors for Air Board, War Office and Admiralty Requirements.
CUTTING AND GAUGING OUR SPECIALITY.
BEST QUALITY MICA ONLY.

'PHONE—4575 CENTRAL.
TELEGRAMS—"MICAYLOR, LONDON."

## TAYLOR & PETTERS, LTD.,
40, HATTON GARDEN,
LONDON, E.C. 1.
*(The Oldest Established Mica House in the country.)*
AND ALL BRITISH.

Telephone: CITY 3115. Telegrams: VANDJARA CENT LONDON
Contractors to H.M. Government

ELECTRICAL INSULATING **TAPES, WEBS, CORDS, SLEEVING, &c.**

DELIVERY FROM STOCK

## JOHN MACLENNAN & CO.,

115, NEWGATE STREET, LONDON, E.C. 1, AND AT 166, INGRAM STREET, GLASGOW.

THE

# ELECTRICAL REVIEW.

VOL. LXXXVIII. MAY 13, 1921. No. 2,268.

## ELECTRICAL REVIEW.

Vol. LXXXVIII.] CONTENTS: May 13, 1921. [No. 2,268

| | Page |
|---|---|
| The Economic Position of the Engineering Industry ... | 605 |
| Electrical Wages Dispute ... ... ... ... ... ... | 606 |
| Whitley Councils ... ... ... ... ... ... ... | 606 |
| International Credits: The Ter Meulen Scheme ... ... | 607 |
| The Institute of Physics ... ... ... ... ... ... | 607 |
| Statutory Undertakings and the Fuel Supply ... ... ... | 608 |
| The Present Economic Position of the Engineering and Allied Industries... ... ... ... ... ... ... ... | 609 |
| The Printing and Allied Trades Exhibition (*illus*) ... ... | 610 |
| New Electrical Devices, Fittings and Plant (*illus.*) ... ... | 611 |
| Legal ... ... ... ... ... ... ... ... | 612 |
| Business Notes ... ... ... ... ... ... ... | 614 |
| Notes... ... ... ... ... ... ... ... ... | 621 |
| City Notes ... ... ... ... ... ... ... ... | 623 |
| Stocks and Shares ... ... ... ... ... ... ... | 628 |
| Submarine Cable Telegraphy, by E. Raymond-Barker (*illus.*) (*continued*) ... ... ... ... ... ... ... | 629 |
| The Daysohms Low-pressure a.c. Welder (*illus.*) ... ... | 631 |
| Magnetos for Internal-combustion Engines, by A. E. Watson (*illus.*) (*continued*) ... ... ... ... ... ... | 632 |
| Joint Electricity Authorities ... ... ... ... ... | 633 |
| Correspondence— | |
| The Wiring of Ferro-concrete Factories ... ... ... | 634 |
| Telephone Cables for Use on Power Schemes ... ... | 634 |
| Charging for Idle Current ... ... ... ... ... | 634 |
| The Maintenance of Intercommunication Telephones ... | 635 |
| Transformers and Changed Frequency ... ... ... | 635 |
| A Peculiar Phenomenon ... ... ... ... ... | 635 |
| Cables for Hot Situations ... ... ... ... ... | 635 |
| Water-Tube Boilers ... ... ... ... ... ... | 635 |
| Dynamic and Potentiometer Control for Cranes ... ... | 635 |
| New Patents Applied for, 1921 ... ... ... ... ... | 636 |
| Abstracts of Published Specifications ... ... ... ... | 636 |
| Contractors' Column ... ... ... Advertisement page xxvi | |

**"ELECTRICAL REVIEW" SUBSCRIPTION RATES.**

| | |
|---|---|
| ***UNITED KINGDOM*** .. .. .. | ***£1 14 8 per annum.*** |
| ***CANADA*** .. .. .. .. .. .. | ***1 12 6 do.*** |
| ***COLONIAL and FOREIGN*** .. .. | ***2 1 6 do.*** |

**Postage Free.**

## THE ELECTRICAL REVIEW.

**Published every FRIDAY, Price 6d.**

*The Oldest Weekly Electrical Paper. Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

***OFFICE, 4, LUDGATE HILL, LONDON, E.C. 4.***

Telegraphic Address: "AGREKAY, CENT., LONDON." Code, A B C.
Telephone Nos.: City 997 Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

**FOREIGN AGENTS:**

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c. Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt Street.
TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "London City and Midland Bank, Newgate Street Branch."

## THE ECONOMIC POSITION OF THE ENGINEERING INDUSTRY.

WE summarise in this issue part of a very remarkable pamphlet published by the Engineering and the National Employers' Federations, the object of which is "To present a comprehensive and reasoned statement of the case, and thereby secure the co-operation of workpeople in bringing about the changes necessary to overcome the difficulty of the present position."

The pamphlet is unsigned, but those responsible for its production have our heartiest congratulations upon a sound and brilliant piece of work.

Being the work of engineers it was sure to be practical, concise, and readable, and above all, reasonable. The penalties of miscalculations and mis-statements fall automatically and promptly upon men engaged in design and construction, and this may be one of the reasons why their work is, generally speaking, reliable. If they design and make any member of a structure or machine too weak for its work, it breaks, and the consequences must at once be faced. Another reason is that having had a scientific education, they have imbibed from early youth a love of truth as the only possible basis for science and practice. The loopholes, evasions, postponements, pitfalls, and dialectic victories of the politician and the lawyer are not for them.

The pamphlet is non-political, and so convincing in its statements and conclusions that it is almost non-controversial. It sets forth the facts as to the depreciated exchanges in a very complete and able manner; and it enumerates all the coincident events which have brought about the present state of things, the Great War being, of course, the fundamental cause.

We may remark in passing, however, that our position is not due only to the war and its effects, as is shown by the fact that one of our most formidable competitors in the iron and steel trade is our own wonderful little ally, Belgium, whose coal pits were producing more than their pre-war output soon after the armistice, and which is now exporting steel rails and sections at prices far below our costs of production.

The document makes no criticism of the clumsy efforts of our Government, first, to keep up prices (and consequently wages) in order to collect (and squander) more revenue; and afterwards to bring down prices and costs by a sudden deflation of credit which has proved equally disastrous. As stated above, it is a non-political pamphlet, and, therefore, does not touch upon the share borne directly by the politicians in bringing about the present ruin. It shows how the depreciated exchanges have prevented the foreigner who desires goods from buying them; and also how the home consumer ceased to buy, partly because he could not afford the high prices and partly because, as soon as the slump began, he waited for the prices to touch bottom.

It points out the disastrous cumulative effect of the moulders' strike, followed by the present coal strike, coming as they did at times when every nerve should have been strained to meet the commercial crisis.

We are glad to see that after nearly six weeks' complete stoppage there is at last a move to appoint an arbitrator or mediator between the miners and the coal

owners, and that our suggestion of Sir Arthur Duckham as the best man available for the job has been taken up and strongly advocated.

He should have been appointed before the strike began and before all this terrible waste of the national resources took place. We confess that we do not belong to the "fight to a finish" school. All these disputes could or should be settled by negotiation or arbitration taking place without a stoppage. The principle of peaceful settlement once fairly tried, instead of industrial war, would save so much in cash alone, as to make real progress in the standard of living possible once more. The people that say: "Let us make an end of it—fight it out," generally end in making only a bad beginning of more trouble.

The question of capital and credit for industry is dealt with in the document, and it is shown how the manufacturers' depleted capital has become "frozen up" in unsaleable stock, while the banks, duly restricting credit as instructed, refuse the money necessary to carry on.

On the question of taxation, the pamphlet, in its studied avoidance of politics, is almost too restrained; though the share of taxation in adding to the intolerable burden upon industry is clearly stated.

The appalling increase in costs of production of fuel, raw material, and finished machinery is set forth quite clearly and temperately, and without imputing blame, but it is shown beyond dispute that unless those costs can be brought down to a level enabling us to compete with manufacturers in other countries, we cannot hope to sell our goods or to obtain employment.

The cost of living, as the foundation of the *real* value of wages, is also dealt with, and finally sound conclusions are reached. Then follows an appendix giving details of specific recent instances in which trade that we might have had at competitive prices has gone elsewhere, for the one and only reason that our costs of production were too high to enable us to get the orders, even though in several instances manufacturers were willing to work without any profit at all. It is an appendix which almost makes for despair, though there is no spirit of despair discernible in the authors of this work.

They have, very rightly, avoided politics and industrial controversy. But we feel bound to point out indications on these topics which we think spring from their pages, though they are not expressed by them.

This country is industrially in a very serious situation. We depend to such an extent upon our foreign trade that unless means can be found to enable us once more to compete in the world's markets we shall lose them, perhaps for ever. We owe nearly eight thousand million sterling on which we are paying a high rate of interest, and about one thousand millions of this huge burden is due to our friends abroad.

Our profits are disappearing, and costs of production on many articles are nearly double those of our competitors.

In these circumstances we cannot afford to allow our financial and fiscal affairs to be muddled. We cannot afford a vast army of unproductive officials, nor any unnecessary ministers. We cannot afford any kind of incompetence in high places. We cannot afford four hundred millions a year for drink. We cannot afford to find a revenue of over a thousand millions of which only about one-fifth is for extinction of debt. We cannot afford to borrow capital for industry at 10 per cent.

We cannot afford to neglect our water power, or our canals, or to postpone the development of electrical power distribution on an adequate scale. We cannot afford money for unremunerative expenditure, while remunerative undertakings are starved. And to come back to the subject matter of industrial relations, we cannot afford strikes. They are as costly as little wars, and nearly as harmful in other ways.

We cannot afford to "slack" in our working hours, or to neglect or refuse to use any machinery designed to increase our productivity. We cannot afford to starve science and invention. We cannot afford to keep a million ex-service men idle because we won't admit them into industry. An aristocracy of skilled workmen in a protected compound is a thing we *cannot* afford.

---

**Electrical Wages Dispute.**

Last week we recorded, and with no small feelings of satisfaction, that the national executives of the National Federated Electrical Association and the Electrical Trades Union had jointly come to an agreement that they would recommend their members to adopt wage reduction proposals of 10 per cent. in two instalments, namely, 5 per cent. in May and 5 per cent. in July. But if we or anybody else imagined that the Dove of Peace which had been hovering within the precincts of the Ark of the electrical contracting industry intended to settle there, such rash imagination was corrected very soon thereafter, when it was discovered that the said Dove had kept to its wings. Unfortunately leaders seem to have little influence with those on whose behalf they act, and so it came to pass that on Tuesday a strike of electrical contracting employés was in full swing following the decision, as one Press report has it, "that members (of the E.T.U.) must cease work at once against any reduction of wages." Elsewhere it is stated that the men's representatives agreed to submit the 10 per cent. proposal to the rank and file "without recommendation for acceptance or rejection." It is said that a national ballot of the whole of the members of the union resulted in favour of a strike, but only a part of the members have downed tools, and these are in the employ of electrical contracting and shipbuilding firms. Another Press report says "about half the employés have struck work, the others accepting the reduction." As we are not yet familiar with the whole of the circumstances which brought about the cessation of work we are unaware of the grounds on which electrical wiremen and contracting employés claim a continuance of all the advances of recent years now that the cost of living is falling. The electrical contracting industry, at home, like the electrical manufacturing industry both for home and export trade, is in urgent need of decreased costs of production. Work is being held up in the expectation that its cost will fall. Will those who depend upon the industry for their livelihood be so unwise as to prevent its revival at so unpropitious a time? With reasonable prices and stability the slackness at present prevailing in the trade could give place to great activity. If the strike action has been taken against the advice of the Union Executive, it is deplorable from every standpoint, and cannot be expected to succeed; indeed it was reported on Tuesday night that in some instances the men had already returned to work. There seem to be powerful elements at work in the Electrical Trades Union which are never happy unless they are menacing the interests of their trade. Is this the "control" of the industry that has so long been their avowed doctrine?

---

**Whitley Councils.**

We noted with much concern that the Hammersmith Borough Council had decided to sever its connection with the various Joint Industrial Councils formed under the Whitley scheme, and to return to direct negotiation with its own employés on matters relating to wages, &c. The secretary of the E.P.E.A. has addressed a letter to the Council, in which he very ably sets forth the objections to this policy, and the disastrous results that may ensue from its adoption generally, the gist of which letter appears elsewhere in this issue.

We have pinned our faith to the Whitley Council system as by far the most promising means of avoiding not only strikes, but even disputes, between employers and employed, by restoring in a measure that close and intimate relationship which used to exist in the old days

between them, and enabling them to discuss their respective needs and aims face to face. That the work done by these Councils even in their present undeveloped condition has been of immense value to the industries concerned is beyond question; as Mr. Jones points out, and as we have shown from time to time when dealing with this subject, questions of wages and living conditions, though necessarily the first to be attacked, by no means form the be-all and end-all of the Councils' existence—they have many other important functions to serve. By seceding from the system, the Hammersmith Borough Council has dealt a blow at it which is directed in reality against the common welfare, and we earnestly hope that so mischievous a policy will be quickly abandoned. Autonomy is a precious thing within reasonable limits; but carried to the limit by the individual it is nothing other than anarchy. No one in any civilised country has absolute control over his own actions, for he is a member of a community, and his actions may affect the well-being of his neighbours; hence the necessity of a code of laws. The same consideration applies to Borough Councils, and we commend to the notice of the Hammersmith Council the admirable example of no less a municipality than that of the City of Manchester, which not long ago explicitly renounced its freedom and declared its willingness to accept the decisions of the Whitley Councils as binding upon itself.

---

**International Credits: The Ter Meulen Scheme.**

It is common to speak of the League of Nations as of something which it is hoped at some time in the "dim and distant future" to bring into existence, and into action in the world's tangled and troubled affairs.

Believing as we do that the League is actually commencing to function for the peace and welfare of humanity, it is with peculiar pleasure that we record the receipt of a business document from its office in Trafalgar House, Waterloo Place, S.W.—the headquarters at which the Ter Meulen scheme of International Credits is established with Sir D. Drummond Fraser, a prominent banker, as organiser.

A full explanation of the scheme is conveyed in a booklet which may be obtained for 6d. from Messrs. Harrison & Sons, Ltd., 44, St. Martin's Lane, W.C. 2, and the booklet has reached us accompanied by an explanatory note, setting forth the objects and the working of the scheme.

The International Credit is intended only for cases in which necessary security for exports on credit or payment in cash for such exports is not otherwise available. When such cases arise it is requested that the British exporter should express his willingness to accept the Ter Meulen Bonds as collateral security, and propose to the foreign importer to request his Government to put the scheme into operation and furnish the bonds as security. It is only as the need arises and the desire for Government action is manifested by both parties that the scheme will be brought into action.

The foreign Government then has to satisfy the Special Commission of the League of Nations that the security pledged by the bonds is adequate, and it is believed that a certificate to that effect by the Commission will give to the bonds a full face value in the eyes of any British banker, who will then grant the necessary credits to the exporter on this side. Apart from the provision of the collateral security the business will be conducted on normal lines, and the collateral can only be dealt with or realised if default is made by the purchaser of the goods.

The sooner this excellent scheme is brought into operation the sooner will the difficulty of the foreign exchanges be overcome and British export trade restarted.

It would appear to be especially helpful in the case of contracts taking a considerable time to execute, such as those for electrical engineering plant.

We trust that every effort will be made by our business men to utilise this excellent scheme, and incidentally to build up the reputation of the League of Nations.

**The Institute of Physics.**

The recent inauguration of the Institute of Physics raises one or two questions upon which some comment may be offered. In the first place, although there is little doubt that industry generally is now appreciating much more than it did a few years ago the importance of the physicist, there is more than a possibility, owing to the unforeseen reaction which has followed the war, that the full advantage of this appreciation will, at any rate temporarily, be postponed. There is a vast difference between the practical usefulness of the physicist and the chemist in industry, and although the works chemist is now a well-recognised member of most large engineering staffs, we have not yet reached the stage when the works physicist has become equally familiar. Consequently, the physicist must continue for some time yet to depend upon assistance from the Government and donations from industry to carry on his work in the more inspiring atmosphere of the laboratories of our universities and teaching institutions.

Unfortunately, the impoverishment of the nation has compelled the cutting-down of the sum at the disposal of the Department of Scientific and Industrial Research, and this limits the opportunities even for men of promise to carry on original work in physical research. That, however, should not discourage those who have the full industrial development of pure science at heart. There is, of course, a direct incentive to manufacturing firms to subscribe to the funds of their own research associations, and less incentive to put down money for pure science research from which immediate results are not necessarily forthcoming. The inauguration of the Institute of Physics offers one more opportunity for appealing to industry to assist, not only in the national interest, but in the individual interests of particular trades, by the provision of funds which will aid in the conduct of research work in our universities and teaching institutions on well-defined lines.

Another matter which arises out of the inauguration of the Institute of Physics is the position with regard to the formation of new technical institutions. It has been urged that our old-established institutions, which nominally cover every branch of engineering and science, are not able to provide for the greater specialisation that has come about since they were originally formed. There is a good deal of truth in this contention, and one or two instances can be mentioned where some of the younger men, who have been compelled by the trend of events to specialise severely, have broken away and taken action on their own account. A recent example of this is the formation of the Institution of Production Engineers, the complaint in this case being that there is no opportunity at present afforded by any existing society for the discussion of the practical aspects of production, which is such a vitally important problem to all industries to-day. In the same way, a Chemical Engineering Group was formed a few years ago, to give opportunities for the discussion of engineering problems attaching to the chemical industry, and although the Engineering Group is now affiliated to a parent society, at one time there was a threat to break away and form a separate institution. Similarly, the formation of the Faraday Society has fully justified itself, and it seems that the Institute of Physics will equally be found a necessity if full opportunities are to be given for physicists to discuss their own particular problems. This tendency would seem rather to lead away from the ideal put forward on more than one occasion that the older institutions, such as the Institutions of Civil, Electrical, and Mechanical Engineers, should sectionalise themselves and cover the whole field of activities implied by their names. The Institution of Electrical Engineers has, it is true, made a move in that direction by the formation of its Wireless Section, and it may well be that this type of development could be extended with advantage.

# STATUTORY UNDERTAKINGS AND THE FUEL SUPPLY.

[By a Legal Contributor.]

A question of very considerable importance to supply authorities is suggested by the shortage of fuel. Suppose that, owing to their being unable to find coal, those who are under statutory obligation to provide electricity are unable to fulfil that obligation, what is the position? Are they under any penalty, or are they liable to any consumer for breach of contract?

The question involves the consideration of those provisions of the electric lighting Acts which compel undertakers to give a continuous supply.

It is provided by Sec. 30 of the schedule to the Electric Lighting Clauses Act that (1) whenever the undertakers make default in supplying energy to any owner or occupier of premises to whom they are required to supply energy under the special order they shall be liable in respect of each default to a penalty not exceeding 40s. for each day on which the default occurs.

It has been held that where there is no special contract between the undertakers and the consumer obliging the former to give a supply, the latter cannot maintain an action for damages for failure to supply—his only remedy being to proceed for penalties (Clegg *v.* Earby Gas Co. (1896) 1 Q.B. 592).

Taken by itself, this clause imposes a very serious liability upon a company or local authority supplying electricity, for it would extend to every default which they might make. Even if the supply were cut off for a few minutes in the day, it might involve them in a claim for penalties. Its rigour, however, as we shall presently see, is modified by a subsequent clause.

In cases where the local authority are not themselves undertakers, severe penalties are inflicted if there is any failure to supply energy to public lamps. Sub-sec. (2) provides that where the local authority are not the undertakers, and the undertakers make default in supplying energy to the public lamps to which they may be and are required to supply energy under the special order, the undertakers shall be liable in respect of each default to a penalty not exceeding 40s. for each lamp and for each day on which the default occurs. Sub-sec. (3) provides that whenever the undertakers make default in supplying energy in accordance with the terms of the Board of Trade regulations, they shall be liable to such penalties as are prescribed by the regulations in that behalf.

The fourth sub-section is of the greatest interest. It provides "that the penalties to be inflicted on the undertakers under this section shall in no case exceed in the aggregate in respect of any defaults not being wilful defaults on the part of the undertakers, the sum of £50 for any one day, and provided also that in no case shall any penalty be inflicted in respect of any default if the Court are of opinion that the default was caused by inevitable accident or *force majeure* or was of so slight or unimportant a character as not materially to affect the value of the supply."

Let us examine some of the cases in which these provisions have been considered, in order to see whether they provide any answer to the question at issue.

What, in the first place, is *force majeure*, which is sometimes described in legal documents as "the act of God or the King's enemies"? In a case which was heard in Dublin in 1899 it was proved that the supply of energy had broken down owing to certain defects in a cable which had not made themselves apparent for a considerable time. It was held that the Corporation was excused on the ground of inevitable accident (Sun Insurance Co. *v.* Dublin Corporation, December 9th, 1899). But the defence of *force majeure* or inevitable accident will not avail an undertaker in every case. In Shaddick *v.* London Electric Supply Corporation (*Journal of Gas Lighting*, May 8th, 1900, p. 1235), the keeper of certain licensed premises at Deptford summoned the defendant corporation for failure to supply electricity to his premises. The default was admitted, but the defence was *force majeure*, it being contended that the supply of electricity having become deficient owing to unavoidable causes, it became essential that some part of the district of the company should be cut off, and that Deptford was selected as causing the least public inconvenience. The full penalty of 40s. was inflicted in each of the seven cases, with 20 guineas costs in the first case, and 2s. costs in each of the others. It would seem, however, that where the company are taken by surprise, and asked to supply a number of consumers for whom they have not made adequate arrangements, they will be leniently dealt with. Thus in Marylebone Vestry *v.* Metropolitan Electric Supply Co. (*Journal of Gas Lighting*, January 2nd, 1900, p. 34), the company were summoned by the Vestry and Guardians for making default in supplying electrical energy to the workhouse and vestry premises on certain days. The company admitted the default, and contended that the same was due to inevitable accident, caused by the great increase in the demand for electricity which had exceeded their expectations. The case was at first adjourned, and eventually small fines were imposed.

It would seem that if any negligence on the part of the company can be proved, it is futile for them to urge a plea of *force majeure* or inevitable accident.

Thus the faulty laying of a cable which leads to a break owing to subsidence; defective insulation leading to short circuit; carelessness at the central station which leads to a stoppage of all the machinery; none of these things could be pleaded in answer to a summons for failure to supply. On the other hand, the breakage of a cable owing to floods, the bursting of a boiler, or sudden stoppage of machinery owing to some undetected fault would always be received as a complete answer to a charge of failure to supply. But it is essential, in the interest of the consumer, that the company should take every precaution to secure that even when one set of engines breaks down another shall be ready to take its place.

If the undertakers cannot reach the consumer's premises without breaking up land not dedicated to the public use, and the owner of the land refuses his consent to the breaking up, this would appear to be an answer to a complaint under this section (Bellamy *v.* Liverpool United Gas Light Co. (1904), 2 L.G.R. 1,182).

These cases lead inevitably to the conclusion that mere inability from a business point of view to supply is no answer to a claim for penalties. Whether this inability is due to strike or lock-out, or inability to procure coal, the undertakers remain liable for failure to supply. The answer of the consumer who cannot turn on his lamps to the complaint of the company "We have no coal" is clear and explicit. "You are under statutory contract to supply me with electricity, and you have broken that contract. You should have laid in sufficient coal to tide you over the period of a strike."

That any consumer will ever attempt to assert his right to the above extent may be doubted; but it is important for those who are connected with the electrical industry to realise that so far as legislation is concerned they are not at present protected by any strike clause.

# THE PRESENT ECONOMIC POSITION OF THE ENGINEERING AND ALLIED INDUSTRIES.

The following are extracts from a document issued by the Engineering and the National Employers' Federations (Broadway, Westminster, S.W. 1). We refer to the matter in our leading columns. Since our article was written we have been favoured with a copy of a pamphlet issued by the Amalgamated Engineering Union in reply to the Employers' statement. We propose to treat it with equal fullness in a later issue:—

## The Fundamental Cause of the Depression.

The fundamental cause of the existing depression is the war, and we have to find to what extent the various changes which the war has brought about are the predominant causes in the present depression.

The first consideration of the position reveals the fact that there are in the world, at the present time, two great classes of people with whom we are mostly concerned:—

(*a*) Those who want to buy and can't.
(*b*) Those who can buy and won't.

The position of the peoples in all these countries who want to buy but can't is symbolised by the state of the exchanges as between their currencies and our currency.

## Foreign Exchanges.

If English currency for the moment is taken as the standard, the currency of all these other countries is depreciated, because in all cases for the last two years or more the productive industries of these countries have been abnormally disturbed, their exporting capacity has been excessively reduced, and at the same time they have been seeking to buy food, machinery and raw material. For the time being they have largely exhausted their buying power and that means that they have exhausted the capacity to give employment to people of the United Kingdom who are engaged in manufacturing industries.

There are some countries that will be able to renew their productive industry (including agriculture), and therefore in due time to export, if they can receive supplies of machinery, of materials, of seeds, &c. In these cases it is proposed that export credits should be provided, but export credits are nothing but loans, and when an export credit is made we are lending to the country assisted, the product of British labour, capital and industry, notably in the form of manufactured goods, and the degree of stimulation to British industry which export credits can provide is a very limited one and in fact limited to the extent to which industry can be maintained by a Government seeking to borrow in order to maintain industry when it is depressed.

The position with regard to trade with a country whose currencies have been depreciated has been aggravated by the high cost of production of British goods. Some months ago the needs of such countries were so urgent that they were prepared and willing to pay any price that might be asked to satisfy their most pressing needs. They are no longer prepared to take that attitude and are holding back until they can obtain goods at a more reasonable price than at present.

While this state of things is dominating the situation it happens at the same time that industrial production is reviving rapidly in Germany. In that country, where the present market par rate of exchange (*i.e.*, purchasing power in Germany) is somewhere in the neighbourhood of 100 marks to the sovereign while the actual international rate is somewhere about 240 to the sovereign, they are in a position to offer goods at less than half the price at which it is possible for British manufacturers to sell. Under these circumstances European countries are naturally turning to Germany to supply their wants, and it is manifestly becoming daily more difficult to obtain orders for British goods from the Continent.

## Australian and Far Eastern Exchanges.

The state of affairs prevailing in India, China, and Australia, though arising out of the war, is very different in character from that which has disturbed the European exchanges. The unit of Indian currency is the rupee, a silver coin, but owing to the fact that the price of silver for many years before the war was kept fairly steady, and owing also to the fact that the balance of trade as between the United Kingdom and India was, all factors being taken into account, kept steady, it was possible, through the joint action of the Home Government and the Indian Government, to stabilise the rupee at 1s. 4d., *i.e.*, 15 to the sovereign. The war caused a vast disturbance to the balance of trade, and stimulated activity, both in India and in China, the other great silver using country, with the result that there arose a great need for additional silver for coinage purposes. At the same time, the annual production of silver was being severely restricted owing to the Mexican Revolution. The combined effect of increased demand with reduced supply forced the price of silver to a level about three times as high as its pre-war level. The Government machinery for regulating the Indian exchange completely broke down in face of the overwhelming economic forces which were brought into play, and at one time the rupee attained the extraordinary value of 2s. 8d., that is to say, double its pre-war exchange value. Extraordinary measures had to be taken, and the United States Government, by selling several hundred million ounces of silver from their reserves to the Indian Government, eased the situation.

A committee of the best experts investigated the question and recommended certain measures which were adopted by the Government, the outstanding one being that an effort should be made to stabilise the rupee at the value of 2s., *i.e.*, 10 to the £. At the time the recommendation was made this represented an effort to reduce the value of the rupee, but shortly afterwards the price of silver began to fall because the Mexican production was resumed and also because the replacement of silver currency in Europe by paper money enabled enormous quantities of silver to be made available for Indian and Chinese currency requirements. The price of silver fell with even greater rapidity than that with which it rose, and to-day it is only a few pence per ounce different from its pre-war value—the rupee being once again somewhere about 1s. 4d. or a little less in value.

When the rupee was worth 2s. 8d. India placed enormous orders in this country, particularly for textiles, and the extraordinary flow of orders continued even after the fall of the value of the rupee had begun because the rupee still had a higher relative purchasing power if used to buy goods from abroad. When, however, many of the goods were actually delivered in India the value of the rupee had fallen below the stabilised rate of 2s. in the £ and Indians who expected to pay for goods on arrival at the rate of 10 rupees for a sovereign's worth, found themselves called upon to pay 15. Warehouses at the Indian ports are still full of goods of which the Indian purchasers will not take delivery, and for the moment orders from India are negligible in amount. Congestion of warehouses in Australia and South America has taken place for similar reasons.

With regard to Australia and New Zealand, the position which has arisen is a direct consequence of the war. The Australian wool-clip and much of the Australian wheat harvest, together with supplies of meat from New Zealand, were bought by the British Government as part of the policy for maintaining food supplies during the war, for preventing abnormal increases in prices, for securing adequate supplies of wool for clothing the army, and also partly to assist the Australian Government during those times when shipments were held up. The payments of the British Government were made, generally speaking, when goods were delivered into warehouses in Australia, whereas in the case of private purchasers, while the practice would vary probably from case to case, yet, generally speaking, payments were made against shipping documents in the form of a bill of exchange, having a currency of three or perhaps six months. In effect, when the Government became the main purchaser, the Australians were receiving payment anything from three to six months earlier than they had been accustomed to receive it, and this, of course, had a very stimulating effect on their spending power. When the end of the war came very heavy orders were placed in this country for goods of a kind which could not be obtained during the war in adequate quantities. The demand from Australia and New Zealand became so heavy that Australian credits in London began to run down, and then on top of this there came the change once more from Government buying to private buying, and with the resumption of the ordinary conditions of private trading the Australian found a gap of from three to six months in receiving payments in respect of exports. In consequence of this gap, Australian credits in London are exhausted, British firms who have been paid by Australian bills of exchange find it impossible to discount these bills in London, and export trade to Australia has been paralysed in consequence.

The difficulties which have arisen in the case of India, China, Australia and New Zealand are difficulties of the balance of trade and difficulties of currency, but every buyer in those countries is now infinitely more critical of prices than he was before the collapse came and there is extraordinary reluctance on the part of buyers in those countries to place orders for British goods at the level of prices which has been prevailing. It is very certain that an active state of trade cannot be resumed without lower selling prices, involving a much lower cost of production.

## The Crisis.

From the point of view of British industry the critical month was August, 1920, and if at that time a combined effort could have been made to reduce the cost of production the worst effects of the slump could have been avoided. As a matter of fact, between the end of July and the end of December the increase of wages reported by the Ministry of Labour added £1,434,000 to the weekly wage bill, or, say, at the rate of £70,000,000 a year.

As the Ministry of Labour statistics only cover a little more than half the wage earners, the aggregate increase must have been much greater.

As the "consumers' strike" was then well under way, it is evident that the increased burden could only aggravate the situation.

"The Consumers' Strike."

So far, attention has been concentrated mainly on those who want to buy but cannot, because their own productivity is low for the time being.

The other class, namely, those who can buy and will not, is equally important.

Actually, of course, there is no sharp division between the two classes, because naturally those who are in urgent want of commodities, whose purchasing power is also reduced, are in many cases not exercising that power in full, because they hope to do so at better advantage later on. This is particularly the case of the ordinary consumer, who is not buying, say, a new suit of clothes because he is waiting till the price is at rock bottom.

The order of events is shown by the following sets of index numbers:—

| — | *Times* index No. of wholesale prices of materials percentage increase over Dec. 31st, 1913. | Trade Union percentage of unemployment. | Cost of living index No. percentage increase over July, 1914. |
|---|---|---|---|
| December 31st, 1919 ... | 207·8 | 3·2 | 125 |
| January 31st, 1920 ... | 233·0 | 2·9 | 130 |
| February 29th, 1920 ... | 256·0 | 1·6 | 130 |
| March 31st, 1920 ... | 248 7 | 1·1 | 132 |
| April 30th, 1920 ... | 239·9 | 0·9 | 141 |
| May 31st, 1920 ... ... | 217·6 | 1·1 | 150 |
| June 30th, 1920 ... | 190·5 | 1·2 | 152 |
| July 31st, 1920... ... | 195·2 | 1·4 | 155 |
| August 31st, 1920 ... | 193·1 | 1·6 | 161 |
| September 30th, 1920 ... | 180·1 | 2·2 | 164 |
| October 31st, 1920 ... | 170·4 | 5·3 | 176 |
| November 30th, 1920 ... | 128·9 | 3 7 | 169 |
| December 31st, 1920 ... | 107·8 | 6·1 | 165 |
| January 31st, 1921 ... | 82·6 | 6·9 | 151 |
| February 28th, 1921 ... | 61·2 | 8·5 | 141 |

Raw materials reached their highest level at the end of February, 1920; unemployment was at its lowest at the end of April, 1920; and the cost of living was highest at the end of October, 1920.

The Coal Strike.

What was perhaps even more serious was the fact that, at the most critical period of all, the threat of the coal strike was hanging over the nation and buyers at home and abroad avoided making purchases.

The buyer abroad was afraid he would not get delivery, and the buyer at home, particularly the wholesale buyer, was in such dread of the consequence of a coal strike to his business that he was afraid to commit himself.

Then at last, when the coal strike came, foreign competitors seized the opportunity to secure business which might have come to this country.

A coal strike 12 months ago would have been survived as the railway strike was survived, but coming at the critical time that it did, it was fatal to our prospects of evading the worst effects of the slump which was then already in progress.

The aggregate capacity for saving is not equal to the burden imposed upon us, and the shortage of savings, *i.e.*, new capital, has led to higher and still higher prices, which are without parallel, being offered for capital in the form of rates of interest.

The high rates of interest have stimulated savings through further personal economies, but these have not been adequate, and consequently there has been a slowing down of new enterprises.

New Capital is the Engineer's Source of Employment.

The engineer and the builder are fed and clothed out of the savings of those in other occupations, but those, *e.g.*, the farmers of Northern France, of Hungary and of Russia, have at the moment such a slender margin that they cannot achieve the task which incidentally would be enormously to their own advantage. This, to many, may be a new idea, but it is evident that if people in other industries did not save, there could never be an engineering industry at all.

The Freezing of Credit.

Just at the time when the limit was being reached, the fall of wholesale prices already referred to was beginning. Manufacturers and merchants holding of necessity great stocks of material at high prices largely paid for out of borrowed money, were unable to repay the loans from the banks, and the latter being tied up in this way were unable to provide accommodation for others who were just needing it for their enterprises, and who frequently, in consequence, did not know where to turn for the wherewithal to meet their weekly wage bill.

Credit, the life blood of industry, became frozen in great stocks of materials, partly finished and fully finished goods.

Stocks now held will have to be reduced in value to an extent which will induce purchasers to buy, and the holders will have to cut their losses accordingly. This, however, will be possible only if the holders of stocks are able to replace them at much lower prices in future, and this, in turn, means far lower costs of production than exist at present.

*(To be concluded.)*

## THE PRINTING AND ALLIED TRADES EXHIBITION.

The catalogue of the sixth International Printing, Stationery, and Allied Trades Exhibition, which opened at the Agricultural Hall on April 30th, recalls that a conspicuous feature of the 1914 show was the number of German firms showing goods. But "*Nous avons changé tout cela*," and the present exhibition is free from any suspicion of ex-enemy invasion. This, however, does not mean that it is "all British," for both France and America are well represented. Naturally electricity looms large in such an exhibition; the advantages of the electric drive with its ease of control, cleanliness, and efficiency have made it indispensable to the printing industry. We have it on the authority of the official electrical contractors that motors representing a load of about 700 kW are in use on the stands.

Motors specially adapted to printing work are shown by Electromotors, Ltd., and the Swedish General Electric, Ltd.

Electromotors, Ltd., has upon its stand a 3-h.p. compound wound motor for operation on 110 volts at 960 r.p.m. The speed of this machine can be raised 25 per cent. by shunt regulation, and decreased 33⅓ per cent. by series regulation. A drum type controller designed to give unlimited "inching" and to control the speed is used to demonstrate the capabilities of the motor. The other machine shown is also a compound wound motor of 4½ h.p. at 630 r.p.m. The speed is capable of increase up to 950 r.p.m. by shunt control. An "Igranic" control panel is connected to this machine; this panel comprises a compound hand-operated series and shunt regulator and automatic starter with dynamic braking. The bulk of this firm's exhibit, however, is to be found in actual use upon the stands of other firms. Its motors are driving machinery for the following exhibitors: Geo. Mann & Co., Ltd., Furnival & Co., Ltd., Miehle Printing Press & Manufacturing Co., Ltd., W. H. Lockett & Co., and Crosland, Ltd.

The Swedish General Electric, Ltd., displays several types and sizes of motors suitable for printing works. The d.c. motors shown include three of the "K" type, shunt wound, interpole, variable speed machines. These have a normal speed range alteration of 50 per cent. by shunt adjustment. The sizes shown are 1 h.p., 1,250 r.p.m.; 2 h.p., 1,000 r.p.m., and 4½ h.p., 480 r.p.m. The exhibition supply is d.c., and for the operation of its a.c. machines, the company has installed a motor-generator set of 15 kVA capacity, converting the

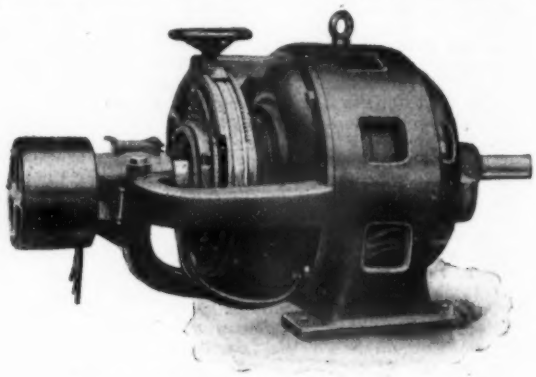

Fig. 1.—Swedish G.E. Commutator Motor.

d.c. supply into a.c. at 400 V; the set operates at 1,000 r.p.m. Three examples of "Century," single-phase, self-starting, repulsion-induction motors appear on the stand; these are of .25, 1, and 5 h.p. operating at 970, 1,460, and 1,460 r.p.m. respectively. A single-phase 5 h.p. reversible lift motor with controller is also exhibited. The three-phase machines include a 10-h.p., 960 r.p.m., slip ring motor, and a 2-h.p. squirrel cage motor working at 1,410 r.p.m. The *pièce de résistance* of the exhibit is a three-phase commutator motor giving from 10 to 30 h.p. at speeds ranging from 350 to 1,050 r.p.m. (fig. 1). The simplicity and reliability of the induction motor have led to its adoption to a very great extent, but its economical speed regulation has proved a difficult problem. Regulation by means of resistance in the rotor circuit has been employed almost exclusively for some speed changes. For larger ranges of speed the a.c. is either converted to d.c. or tandem motors or multispeed motors with windings for two or more sets of poles can be used. In the type of variable speed motor exhibited, which was designed by Mr. H. K. Schrage, a Swedish engineer, the primary winding is placed on the rotor and the secondary winding on the stator. The motor also has a regulating winding, which is similar to a d.c. winding, with a commutator, and which is placed in the same slots in the rotor as the primary winding. The speed of the machine is changed by the introduction of a boosting or "bucking" voltage into the secondary winding. This voltage is taken from the regulating winding by means of the brushes on two separate rocker arms which are adjustable in relation to one another. The auxiliary voltage is varied by shifting the

brushes, and in this way the speed of the motor is varied in the same proportion. The brush rocker arms are furnished with geared segments, and are shifted by means of a pinion and handwheel. For the larger sizes this gear can be driven by a small auxiliary motor mounted on the top of the machine. The advantages of this commutator motor are that it can be started without rheostats with the brushes in the starting position, when the motor will run at about one-third maximum speed; regulation can be made while the machine is running under load, and the motor can give constant torque at any speed. The power factor at the highest speed is between .95 and unity.

Messrs. W. Canning & Co., Ltd., show apparatus for the electro-deposition of metals, &c. A motor-generator set shown has an input of 12 A at 220 V, giving a current of 250 A at 6 V. Plating dynamos of very strong construction are exhibited; one of these gives a current of 2,000 A at 6 V, and the others range down to a small sized machine with an output of 100 A at the same voltage. A special vat for depositing copper on cylinders is exhibited. This is fitted with gear to revolve and burnish the cylinder, while deposition is taking place. Other exhibits are resistances and shunts with brush contacts, vats for electrotype and for nickel facing stereos, &c.

Messrs. A. W. Penrose & Co., Ltd., in addition to printing and composing machines, show "Sunray" vertical arc lamps for photographic reproduction, giving a diffused powerful white light. A vacuum printing frame shown is fitted with a small exhausting motor pump. Vertical arcs for photographic purposes are also exhibited by Pictorial Machinery, Ltd.

Messrs. William J. Light & Co., Ltd., exhibit also for the Swiss firm Winkler, Fallert et Cie. This exhibit includes a number of machines operated by electric motors. A number of metal melting and casting machines are electrically heated. Among these are a rotary matrix drying drum, a flat casting box, and a linotype melting pot fitted with an automatic temperature controller.

Messrs. Witton-James, Ltd., have an exhibit comprising all types of equipment for variable speed driving with full automatic or semi-automatic control. A complete 30-h.p. motor equipment for driving rotary wet presses and calenders is shown. This consists of main and auxiliary motors. The set is put into operation by first starting up the auxiliary motor which rises to full speed when it is cut out by the action of a centrifugal clutch, and the main motor is then driven straight from the mains. The ease with which speed can be varied by a motor-driven sliding resistance, controlled by push-button equipment, is very marked. The push-button arrangement permits starting and speeding up, stopping and slowing down, as well as inching, and the interval of time elapsing between the pressing of a button and the result is hardly appreciable. By connecting up several of these push-button equipments in series the pressing of a safety button prevents the starting up of any machine in a set. A 20-h.p. "Kingsbury" variable speed motor is exhibited. This is also fitted with push-button control, allowing the machine to be operated at any speed from a slow crawl to a high maximum. The motor operates at maximum efficiency from half to full speed. A self-contained linotype machine shown is a very compact piece of apparatus. The motor is started up when the operator takes his seat by the lifting of a flap with his knees. When the operator rises the flap falls and switches the motor off. This equipment obviates the running of a large motor when only a part of the plant is required to be used. The patent electro-magnetic reel brake system shown maintains a constant web tension whatever the size of the roll of paper. The over-running of a reel is prevented by an electro-magnetic brake. The rest of the exhibit is composed of small jobbing press equipments and accessories of various kinds.

The Igranic Electric Co., Ltd., is not exhibiting separately, but its control equipment appears on a number of stands where printing machinery is shown running. For small direct current motors, from ¼ h.p. to 2 h.p., type No. 105 counter e.m.f. type, self-acting motor starter is installed. This is designed and intended to supply the need for a comparatively inexpensive automatic starter for such machines as guillotines, croppers, boring boxes, &c. It is provided with a single pole "clapper" type main switch with magnetic blow-out, and a single step of starting resistance which is automatically cut out by a second "clapper" switch when the motor has reached approximately half normal speed. The motor is started and stopped by simply pressing a button located in a convenient position on the machine. For starting and controlling the speed of electrically-driven flat-bed printing presses, the "Junior Universal" panel (fig. 2) has been widely adopted. This type of panel is made in standard sizes from ¼ h.p. to 3 h.p. The panel comprises the following: A self-acting starter of the solenoid multiple-finger type. The fingers are mounted on a revolving shaft which is operated by a solenoid and timed by an adjustable dashpot. To start the motor the fingers make contact in succession, each cutting out a section starting on full field. A shunt field regulator with 15 contacts and an external operating handle is provided to give any desired speed range. A magnetically-operated circuit breaker or "clapper" switch is interlocked with the starter in such a manner that the circuit is always closed and opened on the circuit breaker contacts and not on the starter contacts. This feature is particularly important where inching is practised. A powerful magnetic blow-out disrupts the arc. A double pole main switch for external operation isolates the starter and regulator when in the "off" position. The whole of the switchgear is contained in a totally enclosing cover with drip-proof ventilating hood and cable intake. The front and sides are easily removable, leaving the switchgear and resistance fully exposed for examination or cleaning without the necessity of disconnecting the panel or taking it down. For flat-bed machines requiring more than 4 h.p. the No. 250 "Universal" control panel is being used. This

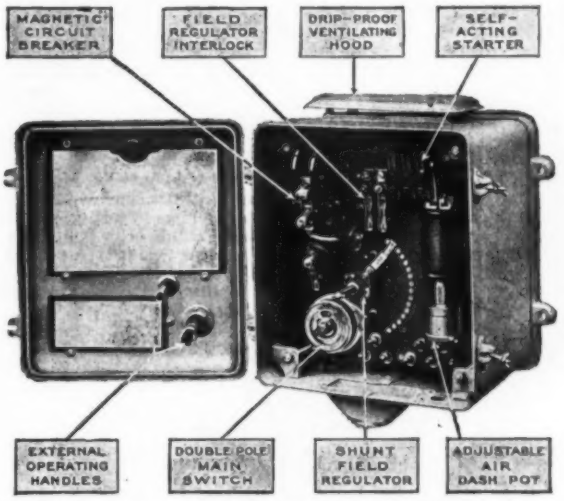


Fig. 2.—Igranic "Junior Universal" Control Panel.

type of panel embodies the same features as those described in the case of the "Junior Universal" panel. The current carrying parts, however, have an increased capacity, and the multiple finger type starter is replaced by a solenoid-operated contact lever which moves over a number of renewable copper segments. The control panels are usually fixed on the wall or an adjacent pillar; the only portion actually on the printing press is an appropriate push button or master switch.

Messrs. Fry's Metal Foundry, Ltd., show a number of metal melting pots each equipped with a Foster pyrometer connected up to a central indicating instrument. Among other firms exhibiting may be mentioned Messrs. Gilbey & Herman, printing ink manufacturers, who have their stand illuminated by means of the Sheringham daylight lamps and reflectors, and Messrs. Thomas & Bishop, Ltd., who exhibit "Cling Surface" belt dressing and Gale's commutator compound for the prevention of sparking.

## NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

***Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.***

### Shadowless Lighting.

A recent issue of the *Scientific American* describes a device invented by a Frenchman, M. Verain, for giving a light without shadows in such situations as surgeries, operating theatres, &c., where shadows must be entirely eliminated. A gas-filled high-efficiency incandescent lamp is placed in a cylindrical lens cell of the same general design as the lenses of the usual mariner's lights. This lens system serves to project the rays of light sideways, where they come into contact with 50 mirrors arranged as sectors around the inside of a large metal bowl reflector. These mirrors are tilted at such an angle as to throw the reflected beams of light downward, thus forming a concentrated circle of light. The area of this circle of light may be increased or decreased by varying the distance between the light source and the surface on which the rays are concentrated; and as the light is reflected from 50 mirrors, if the surgeon's hands or instruments cut off part of the rays there are others that are not cut off, and thus supply the required illumination.

### Oil Burner for Steam Boilers.

Messrs. Alexander Duckham & Co., Ltd., have recently circularised electricity works engineers, pointing out that there is plenty of fuel oil in the country, and it appears that the only obstacle to substituting it for coal in this emergency is the supply of burners. They therefore think it will interest station engineers to know that they make their own burners in a few hours out of ordinary iron pipes, at the cost of some

10s. each, without valves or flex, and find them as good as any proprietary burner that they have tried. The accompanying illustration (fig. 3) shows the construction of the burner. As to the furnace, in an emergency a rough but quite useful method is to let the burner play on a heap of fire brick; but it is preferable to build a baffle wall across the furnace, preferably chequered with open spaces, say, about 3 in. square. In lieu of a supply tank, a barrel placed a few feet above the level of the burner can always be kept filled by the fireman from the barrels in which the temporary supply is received. The company is not offering fuel oil, as its crude is of far too high a quality; these suggestions are offered simply to help in the present emergency. Notes accompanying the circular give full information regarding the installation and use of fuel oil burners, the kind of oil to employ, &c.

The illustration, with the footnotes, explains itself. We think the thanks of the electrical industry are due to Messrs. Alexander Duckham for their very useful and disinterested advice on this subject.

### The "Heatrae" Boiling Ring.

A neat boiling ring has been brought out by Messrs. Electric Fires, Ltd., of King Street, Norwich, which we illustrate in fig. 1. The design is ingenious, and resembles that of the "Heatrae" fires, already described in this column; with the exception of a light cast-iron top-plate, the

Fig. 1.—"Heatrae" Boiling Ring.

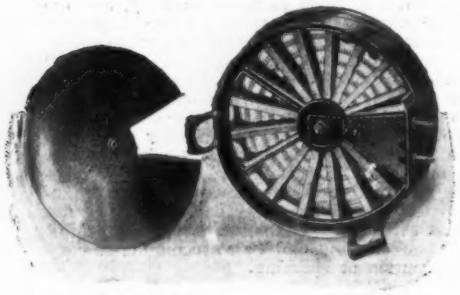

Fig. 2.—Bottom Removed, showing Heater.

parts of which are free to expand without fear of distortion or cracking, the whole of the metal parts are pressed or stamped out of thin sheet. By unscrewing a milled nut, which cannot be detached, the bottom plate can be removed; it consists of a plain disk to which is pinned a polished aluminium reflector, the shallow air space between the two serving as an effective heat insulator. The heating spirals are threaded through refractory bridges, as shown in fig. 2, which are held in position by simple means with perfect freedom, but perfect security. By removing another nut, access is gained to the terminals, which are heavily insulated with mica centred by the neat device previously described. The whole of the design is pleasing from the mechanical and electrical points of view, and in operation the ring is very satisfactory, heating up quickly to a red heat. A sample which we have been using is rated at 1 kW and has proved both convenient and effective.

**A Foreigner's View.**—A Dutch visitor writing to the *Newcastle Daily Journal*, expresses surprise that such a great coal-producing country as England should allow its biggest asset to be so shamefully wasted. He asks:—"What is it that has held this country back from adopting modern methods of power, lighting and heating? Engineers the world over are agreed that electricity is the most economical power that can be produced from coal, and yet in England its development seems strangely slow.

"I do not wish to boast particularly about my own country, but I cannot help mentioning the fact that practically every house in Amsterdam has electric light, and a very large number of them rely upon electricity for heating and cooking."

## LEGAL.

### The Nash Fish Hydrophone.

(*Concluded from page* 603.)

When the case was resumed on May 3rd, Mr. Nash went into the witness chair, and Mr. Gray asked him if he was personally familiar with the hunting of the submarines by the "Nash fish."

Witness replied that he was, and in reply to the Chairman he said he had made about 100 trips. He did not think the submarines went more slowly or less noisily as the result of his fish.

Mr. Gray then questioned the witness as to his out-of-pocket expenses in perfecting his fish, and Mr. Nash said he thought it would be about £3,000.

Sir Arthur Colefax asked witness if it was true that the Admiralty offered him a salary. Witness said that was so, but later on Capt. Fisher withdrew it.

Sir Arthur Colefax said Capt. Fisher had no authority to withdraw it, and asked witness if it was not true that he wrote stating that he wanted no salary, and that it was an honour to him to be engaged on such work. Witness replied that that was so.

Mr. R. A. Mack, one of the claimants, gave evidence as to a visit he made to Scotland in May, 1916, for experimental purposes.

Mr. Heath Brown said that in March, 1917, he was chief technical expert attached to the anti-submarine division. The Admiralty had a directional hydrophone which would be capable of dealing a serious blow to the submarine menace provided there was not the trouble of the water noise. He told Mr. Nash that if he could succeed in solving the problem of the water noise he would probably be of some use. Witness went to Poole, and Mr. Nash took him in a motor launch, behind which the "fish" was towed. The test was sufficient to show him that the water noise had been eliminated without

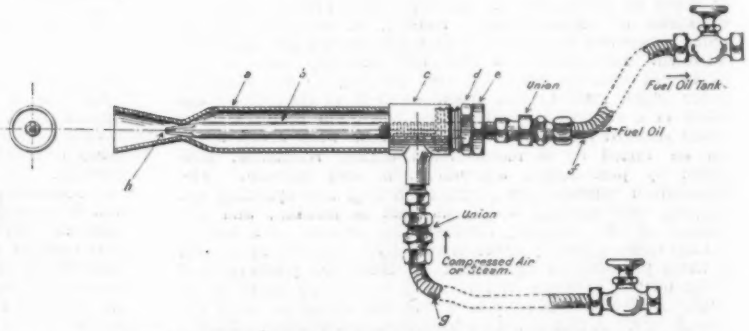


Fig. 3.—Improvised Oil Fuel Burner, Part Section.

*a*, 1½-in. steam pipe swaged down to neck about ⅞ in. internal diameter. *b*, ½-in. steam pipe, drawn out to jet ¼-in. internal diameter. *c*, 1½-in. × ½-in. × 1½-in. steam tee. *d*, 1½-in. × ½-in. bush. *e*, Locknut, permitting axial adjustment of jet to neck of outer tube. *f*, Flexible connection to oil-fuel tank. *g*, Flexible connection to compressed air or steam supply. *h*, ½-in. jet, externally fluted to centre in the neck without closing it.

any loss of sensitiveness. No one had up to that time, to his knowledge, solved the difficulty. He suggested to the Admiralty that fifty of the "Nash Fish" apparatus should be ordered for service at once. He came to the conclusion that the "Nash Fish" apparatus was by far the most successful device for chasing submarines during the war. After the "Nash Fish" had been accepted they had the "Porpoise" device and the American "K-tube" device. These, however, were not in use until many months after the "Nash Fish."

Capt. Humphrey Walwyn said he was Assistant Director of the Anti-submarine Division of the Admiralty, and in that capacity was acquainted with the devices for defending our ships against the German submarines. There were several devices in use, but none of them could detect a submarine from a moving vessel. In January, 1918, he was ordered to take the command of the whole northern control, and he found that the "Nash Fish" was the only device that could locate and follow a submarine, although it was disappointing at times. Witness had been in many extraordinary submarine hunts, and the longest he remembered occupied some eighteen or twenty hours.

The Chairman: Quite apart from the "killing" of a submarine, is the hunt of value?

Witness: Undoubtedly. After a submarine had got through the barrage it was not quite so happy when it went back.

Lieut. Chas. Dickson Seropian said he was in six hunts altogether. He found the "Nash Fish" system very satisfactory for hunting submarines. His machine picked up the noise of a submarine eight miles away. He claimed that he sank two submarines. He was perfectly certain he sank one.

Other witnesses were called for the claimants, and all stated that the "Nash Fish" was the most efficient apparatus for detecting submarines.

Sir Arthur Colefax opened the case for the Admiralty by first calling evidence.

Mr. Louis Chas. Bernacchi said he was appointed to the Anti-submarine Division of the Admiralty, and he thought the "K-tube" appliance was better than the "Nash Fish."

The Court adjourned until Monday, May 9th, when the hearing was resumed. Mr. Bernacchi said he did not think there was any ground for thinking that because of the "Nash Fish" the Germans were forced to make their submarines less noisy.

Commander Sawbridge, of H.M. Navy, said he joined the submarine section of the Admiralty in April, 1918. He knew that a large number of trawlers were ordered to be equipped with the "Nash Fish," and that it was a very expensive apparatus. There was a terrific menace then, and any measures taken would have been justified, however expensive they might be.

Commander H. I. R. Trischler, R.N., one of the Director's assistants for anti-submarine duties in connection with the Admiralty, said that in a report of the trials it was stated that the "Nash Fish" was well designed; he thought it was defectively designed, and was a totally misleading device.

So far as the electrical method is concerned of turning a hydrophone in the fish, is that novel in principle?—In all our fire-control instruments we practically have the same idea.

As far as I can make out the "Nash Fish" equipment cost something between £500 and £700?—I have the amounts per trawler. I should say about £850 is the average.

Cross-examined by Mr. Hunter Gray, witness said he did not think the "Nash Fish" was of any value at all.

Were you more in favour of the porpoise?—No, I hold no brief for the porpoise; that appliance failed as badly as the "Nash Fish."

Commander Turle, D.S.O., said he had had considerable experience in the hunting of enemy submarines during the war. Compared with the S.C. tube the "Nash Fish" was unfavourable in calm weather and favourable in rough weather. At one time he thought the "Nash Fish" would succeed where the S.C. tube failed, but he found ultimately that it was less reliable than the S.C. tube.

Cross-examined: The "Nash Fish" gave a lower percentage of false bearings than other devices.

Mr. Eric B. Hughes, who took part in a number of submarine hunts, said his experience of the "Nash Fish" was that it was unreliable. The greatest trouble was the breakage of the wires. The S.C. tube was more reliable as to accuracy of bearings.

Commander Farquharson, who is now in command of the Anti-Submarine School at Portland, said that at times he found the "Nash Fish" satisfactory, but it gave bearings which were quite unreliable, and the submarine was often in the opposite direction to that given by the "Nash Fish." There was considerable cable trouble. On the whole, he did not consider the "Nash Fish" satisfactory.

Lieut. F. M. Symon also considered that the "Nash Fish" was unreliable.

At the close of the evidence Sir Arthur Colefax addressed the Commission. He said he had given Mr. Nash the credit of being industrious and ingenious, and he had not said that Mr. Nash should not receive any consideration for the work he did. But this was a grossly exaggerated claim. It started as a claim for a quarter of a million of pounds, and Mr. Hunter Gray reduced it to £100,000. It was all a question of amount. Mr. Gray opened the case as if the submarine menace was defeated by this invention. It was nothing of the kind. It played a small part, and nothing more than that, in meeting the submarine menace. It was no better than the other devices, if as good. He contended that no submarine was destroyed by the "Nash Fish." The cables and the electric appliance gave trouble, and it was not a practical device. He suggested that something in the neighbourhood of £1,000 would be a proper award in this case.

Mr. Hunter Gray, K.C., on behalf of the claimants, submitted that the evidence had clearly proved that the most powerful factor in dealing with the German submarine menace was the "Nash Fish," and it took a most important part in reducing the losses in the national shipping. When he opened his case he mentioned £100,000 as the amount of the award that should be made, and he submitted that that was about the right figure.

The Chairman said Mr. Gray had submitted one basis on which the Commission should fix their award, but there was another way, and that was to give five or ten per cent. on the amount which the Government had expended in connection with the invention. The Government had spent £175,000 on this invention.

Mr. Hunter Gray said he did not agree with the chairman that his suggestion should apply in this case.

This closed the case, and the Commission will make their award in due course.

---

### Mate *v.* The Vulco Magneto Co.

In the King's Bench Division, before Mr. Justice Bailhache on Monday, Gordon Harold Mate, of Lee, Kent, brought an action against the defendant company, of Long Acre, London, claiming £3,500 damages for alleged breach of contract.

Mr. La Queene, for the plaintiff, explained that there was a contract between the parties by which the defendants agreed to sell to the plaintiff 500 Bosch magnetos at 9 guineas each. They were to have been delivered within 14 days, half of the number to be shipped to the United Kingdom within seven days. Those arrangements had been confirmed by the defendants. As a matter of fact, counsel continued, no magnetos had ever been delivered, and defendants, in answer to the claim, had raised a curious defence. They claimed to have the contract rectified on the ground that it was contained, not only in the document in dispute, but in several other letters, some of which really did not pass between the parties to the action. They further contended that the contract was partly verbal. The matter began in a sale of 500 magnetos by the defendants to the Brompton Motor Co., who in turn sold them to the plaintiff. Some trouble arose because the defendants wished to alter the terms of their agreement with the motor company. Plaintiff was asked whether he would accept the alterations, but refused. The motor company then declined to go further with the matter, and the direct contract between the plaintiff and defendants was the result. The plea for rectification, commented counsel, was really an attempt to read into the contract some correspondence which passed between the motor company and the defendants. The two terms they sought to add were that if they failed to carry out their contract they should suffer no further penalty than cancellation, and that the plaintiff should give a certificate showing that the magnetos were for commercial use only.

His Lordship, giving judgment, held that as there was really no market for the magnetos, plaintiff was only entitled to the loss of profit he would have made had the goods been delivered. He therefore gave judgment for £400 with costs.

---

### Electrical Appliances, Ltd., *v.* Mallis.

The Lord Chief Justice, in the King's Bench Division, on May 3rd, heard an action by plaintiffs against one Mallis, a former employé, and his wife, in which an injunction was sought to restrain them from continuing libellous conduct.

Mr. Maddocks, appearing for the plaintiff company, said his clients sold a vacuum cleaner manufactured by the Eureka Vacuum Cleaner Co., of America, and the defendant Mallis was in 1915 employed by them as traveller, and was given North-West of London to travel in. After a time he expressed a desire to have the South-Western district instead, but was told that the change could not be made. He thereupon wrote a circular letter to the trade houses stating that he was about to sever his connection with the plaintiff firm because there was trouble with the staff. Then Mrs. Mallis, the defendant's wife, went to plaintiffs' offices, and bursting in upon a director, abused him until he threatened to send for the police. She subsequently wrote a letter to the Eureka Co., accusing plaintiffs of dishonourable conduct. She compiled a book descriptive of them which she published and sent to Harrods, Whiteleys, and other big firms. The book was also circulated amongst the plaintiffs' staff. She wrote: "I regret I am unable to requisition the Salvation Army band to take up its stand outside your office to play 'Lead, Kindly Light.'" She also obtained placards some feet in length upon which appeared words imputing dishonourable conduct to the company, and challenging them to bring her to justice. With this placard she paraded up and down the street outside plaintiffs' Oxford Street premises. She had a photograph taken of herself carrying the placard which she sent to the Eureka Co. Under the circumstances the only thing the plaintiffs could do was to apply for an injunction to restrain the defendants from continuing their course of conduct. The injunction had been granted, and he (counsel) had seen counsel for the defendants, and had been told by him that Mrs. Mallis was carried away by her feelings because she thought her husband had been badly treated. It was useless to ask for damages, and if defendants would give an assurance not to repeat the libellous statements and annoying conduct that would end the matter.

Mr. Harnay, K.C., for the defendants, said that his clients were prepared to give such an undertaking, to apologise for the annoyance which they had caused the plaintiffs, and to agree to a continuance of the injunction.

His Lordship agreed to the action being settled upon these terms.

---

### Application for Cancellation of Indentures.

On May 5th a local electrical engineer applied to the Sutton Police Court for a summons for the indentures of three apprentices to be cancelled. He stated that the period of the indentures was five years. After the boys had served for two years their trade union demanded that the pay of the boy over eighteen years of age should be increased to 30s. per week, and that of the other two to 31s. per week. The engineer refused to accede to this demand, and as a consequence the union withdrew the boys from his service, and the other employés also ceased work. A further threat was that the union would order its men to refuse to connect up to the electricity supply any installation carried out by the applicant. He had given notice to the apprentices to return, but they had taken no steps to do so.

The summons was accordingly granted.

# BUSINESS NOTES.

**Bankruptcy Proceedings.**—G. DOLBY, electrician, Great Grimsby.—Last day for proofs for dividend, May 21st. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby.

GEORGE EDWIN LEIGH WYNNE, trading as the Amalgamated Trading Co., 44, Surbiton Road, Kingston-on-Thames. The following are creditors herein :—

| | | | |
|---|---|---|---|
| Enfield-Ediswan Cable Works, Ltd. | £100 | Electric Supplies Co., Ltd. | £80 |
| Ediswan Electric Co., Ltd. | 20 | Freeman Electric Co. | 18 |
| Visible Writing Machine Co. | 90 | Simplex Conduits, Ltd. | 60 |
| Driver, Drennan & Cooper, Ltd. | 145 | Sun Electrical Co., Ltd. | 40 |
| Rylands & Sons | 20 | Notable Electric Co., Ltd. | 20 |
| Pawsons & Leaf, Ltd. | 25 | Warren, V. C. H. | 55 |
| International Electric Co. | 25 | Pooley & Austin | 30 |
| L.P.S. Electric Co. | 50 | Stevenson & Rush, Ltd. | 12 |
| Grey, M. C. | 120 | Lancaster Engineering Co. | 90 |
| Hogg, S. | 50 | Electrical Conduits, Ltd. | 15 |

L. P. HOWSE & G. H. B. SNELL (Howse & Snell), electrical engineers, 6 and 8, Duke Street, Margate, Kent.—The public examination of these debtors was held recently at the Guildhall, Canterbury. The Official Receiver stated that the statement of affairs compiled by the debtor Snell showed liabilities of £1,873, while the net assets amounted to £623, or a deficiency of £1,250. It appeared that debtors commenced business in partnership after serving in the Army, Howse looking after the outside work, and Snell the books. Howse possessed no capital, but Snell provided a small sum, while his father advanced £50 in December last, and guaranteed an overdraft of £250 at the bank in March. At first they were successful, but their work consisted to a large extent of installation work, and they lost money over it. They were questioned with reference to certain people who were said to be partners, and the examination was adjourned.

F. E. PADMORE, electrical contractor, Marlborough Road, Nuneaton.—Receiving order made May 6th, on debtor's own petition. First meeting May 19th, public examination June 13th, both at Coventry.

W. A. DAVIS, electrical engineer, 14, Basinghall Street, Farnley, Leeds.—Receiving order made May 5th, on creditor's petition.

S. BECKETT, Jun., electrician, Bolton.—First meeting, May 24th, at the Official Receiver's offices, Byrom Street, Manchester; public examination June 15th, at the Court House, Bolton.

A. J. HARRISON (Xtra Lighting Co.), electrical and gas engineer, 4, 5 and 6, Old Market, Sunderland.—First meeting, May 18th; public examination, May 19th, both at Sunderland.

**Company Liquidations.**—PINKNEY & FORSTER, LTD., electrical engineers and contractors, Newcastle-on-Tyne.—A meeting was held, Mr. Leslie Brown presiding, at which a statement of affairs was submitted showing a surplus of assets over liabilities. It was resolved to confirm the appointment as liquidator of Mr. Leslie Brown (Messrs. Stephenson, Smart & Co., incorporated accountants, Saville Row, Newcastle). A committee of inspection was appointed.

T. EMERY'S AUTOMATIC POWER GENERATING MOTORS, LTD.—Meeting called for June 6th, at 18, Adam Street, Strand, W.C., to hear an account of the winding-up from the liquidator, Mr. C. Pillow.

SUBMARINE MOTOR SHIP CLEANER.—First meeting of creditors and contributories May 19th, at Carey Street, W.C.

**Dissolution of Partnership.**—J. K. COTTON & Co., electrical engineers, 2, Water Street, Rochdale.—Messrs. F. W. Brierly, J. Sugden, A. D. Wickham, and A. Taylor have dissolved partnership. Messrs. Brierly, Sugden, and Wickham will continue the business under the same style.

**Trade Announcements.** — MR. Edwin O. Chadwick has resigned his position as manager of the electrical department of Messrs. Strode & Co., after 17 years' service with them, to join Mr. Ernest Withers in the business of Waring and Withers. The style of the firm is now MESSRS. WARING, WITHERS & CHADWICK.

THE KENT ELECTRIC POWER Co. has transferred its offices and wiring department showrooms from Railway Street, Chatham, to 240, High Street, Rochester.

THE IVOR ELECTRICAL Co., LTD., has removed to 36, Red Lion Street, Clerkenwell Road, E.C.1. New telephone number: "Clerkenwell 3663."

MESSRS. PETTIGREW & MERRIMAN, LTD., have removed from 7, Henrietta Street, Covent Garden, to 122-124, Tooley Street, London Bridge, S.E. 1, where they will give trade demonstrations of the "Select-o-phone" automatic telephone system. Telegrams: "Merrigrew, Tooley, London"; telephone number: "Hop 134."

MR. JOHN RUSS, of Maiden Lane, W.C. 2, asks that in future all communications should be addressed to him at St. Andrew's Works, Dunsmure Road, Stoke Newington, N. 16.

**Catalogues and Lists.**—MESSRS. HAY, MARYON & Co., LTD., 14, Bride Lane, Ludgate Circus, E.C., 4.—An extremely well-produced catalogue of water-power plant. The list deals comprehensively with all parts of the hydraulic side of hydro-electric machinery, and the illustrations of Pelton wheels, turbine runners, valves, pipe details, &c., are very good, and the descriptions full and lucid.

ECONOMIC ELECTRIC, LTD., 10, Fitzroy Square, W. 1.—"Wireless Catalogue" (28 pages). This is a very comprehensive list, giving prices and illustrations of all kinds of wireless apparatus—tuners, valves, detectors, condensers, resistances, instruments, &c.

THE NEWMAN ELECTRICAL Co., 64, Newman Street, W. 1.—An illustrated price-sheet of "Nuco" artistic alabaster bowl fittings in various finishes; also Schedule "C," giving revised prices of electrical accessories, including switches, fuseboards, lamp-holders, adaptors, heating apparatus, &c.

MR. WALTER BALMFORD, "Electric House," Whittall Street, Birmingham.—Two illustrated leaflets describing the "Scot" lampholder and shade carrier; also a pamphlet describing the "British R.B." small lighting set.

CARRON Co., Carron, Falkirk, N.B.—An illustrated price-list of 14 "Carron" fires in various sizes and finishes.

SWEDISH GENERAL ELECTRIC, LTD., 5, Chancery Lane, W.C. 2.—An illustrated descriptive pamphlet dealing with three-phase commutator motors.

THE GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C. 2.—Two show-cards dealing with low-wattage gasfilled lamps.

The company has just issued its Bulletin No. 9, "Rotary Converters," describing in detail the characteristics of the machines made in the company's works. The introduction gives general information on rotary converters, including such items as power factor correction, commutation, armature heating, &c. Section II deals with voltage regulation by reactance, and a.c. booster control. Starting and synchronising are covered by Section III, which includes notes on running the converters in parallel. In Section IV the design is described, and full particulars of the component parts are given. Rotary converter substations are dealt with in the last section, and equipment and layout are illustrated. The illustrations throughout are very clear, and the publication is another example of the excellence of modern advertising.

MESSRS. LACY-HULBERT & Co., LTD., 91, Victoria Street, S.W. 1.—List E L B 4. An illustrated and priced pamphlet describing the "Boreas" patent portable electric blower.

MESSRS. THOMAS MEADOWS & Co, LTD., 10, Errol Street, Whitecross Street, London, E.C. 1.—Circular relating to packing cases specially designed to prevent pilferage.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, W.C. 2. Bulletin 36 S, describing a portable transformer unit for X-ray work; illustrated and priced.

**Summer Sports.**—The Tennis Section of Tucker's Athletic and Recreation Club (J. H. Tucker & Co., Ltd.) commenced the season on Saturday last, in glorious weather. The opening ceremony was performed by Mrs. T. R. Martin, supported by Mr. T. R. Martin (joint managing director), Mr. S. R. Davies (production manager), Mr. W. Y. Smith, Mr. H. W. Rodgers, Mr. C. H. Walker, Mr. W. A. Wood (hon. sec., Tennis Section), and Mr. H. Pratt (general secretary). Apologies for absence were received from Mr. and Mrs. J. B. Tucker and Mr. Tranter, who wished the club a successful season, and hoped to be present at some future date. The first tournament takes place on Saturday next.

On Saturday last, Pope's Electric Lamp Co. opened their cricket season with a game against Osram Second XI at Wood Lane, and won by 54 runs, Pope's scoring 139 and Osrams' 85. For Pope's, F. Bryant was successful with both bat and ball, scoring 70 and taking 3 wickets for 41 runs, while Mr. Kenneth Pope got 28 runs and took 3 wickets for 33 runs; Chelsom took 2 for 15.

**Electricity Supply Rifle League.**—The following are the results of the April matches :—Brompton 558, Hackney 557; St. James's 535, Hackney 538; Central 559, Hackney 552; Hackney 538, Fulham 521; Brompton 530, Fulham 479; City Co. 561, Brompton 543; Brompton 551, County Co., 530; City Co. 564, County Co. 526; City Co. 572, Shoreditch 571. The City Co. now heads the list with 10 points.

**Failure of Compulsory Arbitration in Norway.**—The Norwegian Government has decided not to renew the "provisional" Compulsory Arbitration Act, which has been in force since 1916, learns the *Daily Intelligence* of the International Labour Office. It was passed in the autumn of that year largely in order to deal with widespread disputes in the engineering, mining, and superphosphate industries, the introduction of such a measure having been the subject of agitation ever since 1909. The Act was renewable annually, and the period expired on April 1st. The decision to allow it to lapse was largely due to its unsatisfactory working in the conflicts of the past year.—*Daily Telegraph.*

**The Future of Dutch Industries.**—In an interview, Mr. Philips, of the Philips Incandescent Lamp Co., at Eindhoven (Holland), declares that in the long run Dutch industries will not be able to compete with the German producers if the demands of the German working men remain at the present low level. It will not only become necessary for the manufacturer to reduce the profits, but at the same time the Dutch working people must bring their living standard down to a lower level in order to prevent greater unemployment.—*Times Trade Supplement.*

**Copper and Lead Prices.**—MESSRS. F. SMITH & Co. report, May 10th :—"Copper (electrolytic) bar sheets and rods and h.c. wire, no change."

MESSRS. JAMES & SHAKESPEARE report, May 11th :—"Copper bars (best selected), sheet and rod, £114—£2 decrease; English pig lead, £25—30s. increase."

**Book Notices.**—"Electric Arc Welding." (26 pp.) Special Publication No. 7,783/2 of the Metropolitan-Vickers Electrical Co., Ltd., Manchester.—This is an example of modern publicity in which advertisement is combined with technical facts. The introduction is a comparative survey of the several methods of welding in which the utility and efficacy of the electric arc for this purpose are emphasised. The many applications of this type of welding are then enumerated, showing how it enters into every department of engineering. Notes on materials and impurities found in them and their effects are next dealt with. Then the method of procedure is explained, and particulars of electrodes, current strengths, speed and power consumption, are given in tables. The necessary electrical equipment is described in detail, and accessories are also included. The illustrations are particularly good, and bring out the points of the text very clearly.

"Aluminium Bus-bars and Connections" (16 pp.). Publication No. 171B of the British Aluminium Co., Ltd.—Although a trade publication, this pamphlet is an attempt to give an uncoloured survey of the advantages obtainable by the use of aluminium in power stations. Economy is, of course, the keynote, the other points of the superiority of aluminium over copper for bus-bars being given as:—Greater ease in erection; less temperature rise for equal conductance, and a considerable reduction in the weight to be supported. The illustrations, with which the publication is liberally endowed, depict various large installations of aluminium bus-bars, including those installed at Birmingham, which form a splendid example of the work. Several tables are embodied in the brochure giving particulars of the current-carrying capacity, resistance, and other characteristics of various sizes of aluminium bars and connections.

"London Chamber of Commerce Thirty-Ninth Annual Report of the Council and Transactions of the Year 1920."

"*Journal* of the Institution of Electrical Engineers." Vol. LIX, No. 298. February, 1921. London: E. & F. N. Spon, Ltd. Price 10s. 6d. This issue contains the address to the Students' Section by the President.

"Electrical Handling of Materials." Vol. II. Structural Work. By H. H. Broughton. Pp. xiv + 292; 358 figs. London: Benn Bros., Ltd. Price 25s. net.

"Electric Welding." By E. Viall. Pp. xii + 417; 329 figs. London: McGraw-Hill Publishing Co., Ltd. Price 22s. net.

"Heating Systems: Design of Hot-Water and Steam Heating Apparatus." By F. W. Raynes. (Second edition.) Pp. 324; 158 figs. London: Longmans, Green & Co. Price 21s. net.

We have received from Messrs. Henry Frowde & Hodder and Stoughton, 17, Warwick Square, Newgate Street, E.C. 4, a list of technical and scientific books published during the present year as well as several in preparation. Prices and particulars are given.

"High-Tension Switchboards." By Henry E. Poole, B.Sc.(Hons.), &c. Pp. 114; 22 figs. Also "Electricity in Steel Works." By Wm. McFarlane, B.Sc. Pp. 109; 21 figs. London: Sir Isaac Pitman & Sons, Ltd. Price 2s. 6d. net each. (Pitman's Technical Primer Series.)

Technologic Paper No. 170 of the U.S. Bureau of Standards, "Pyrometric Practice." Pp. 326; 185 figs. Washington: Government Printing Office. Price 60 cents.—In this publication a complete treatise on the practical phases and applications of pyrometry is presented. All general methods of measurement, instruments and use and standardisation of apparatus are discussed. The paper is illustrated with photographs of modern American instruments. Many tables are included, and the treatise contains an index for ready reference.

**Westinghouse Co. in Argentina.**—A Government Decree authorises the Sociedad Anonima Compania Westinghouse Electric Internacional, constituted in Wilmington, U.S.A., on May 21st, 1920, to establish a branch or agency in Argentina.—*Review of the River Plate.*

**Zinc.**—Mr. Hoover has announced that the Department of Commerce will undertake surveys of conditions in the zinc markets of the world. He added that he did not know what could be done to help the present unfavourable situation in the United States, but it was hoped that the surveys would disclose where American zinc could be most profitably exported.—*Reuter's Trade Service* (Washington).

**International Rubber Exhibition.**—The fifth International Exhibition of Rubber, Other Tropical Products and Allied Industries, will be held at the Royal Agricultural Hall from June 3rd to June 17th. Sir Owen Philipps, M.P., is the hon. president, and Mr. H. Greville Montgomery is organising manager. Already 40 British and foreign countries, and over 50 associations and firms have secured space. The exhibits include rubber manufactured articles, reclaimed rubber, compounding ingredients, machinery, and appliances, &c. International congresses will be held dealing chiefly with the rubber industry.

**Iron Castings.**—THE BIRTLEY IRON CO., of Birtley, announce that special arrangements have been made to keep their foundries at work during any prolongation of the coal strike, supplies of pig iron and coke being assured. They are making turbine, colliery, and other castings up to 30 tons weight.

**Australia and Trade with Germany.**—*The Times* Melbourne correspondent reported on May 6th that it was stated in the House of Representatives that all restrictions on exports, including exports to Germany and Russia, had been removed. Imports from Germany are limited to articles such as parts of machinery which are unobtainable elsewhere.

**The Coal Dispute.**—Upon the whole the electrical industry seems to be carrying on remarkably well in this, the sixth, week of the dispute. Supply undertakings generally are still able to give a restricted output and limited tramway services are still available.

It has been reported in the Press during the current week that a number of well-known electrical and cable manufacturing companies have been discharging thousands of employés owing to the coal situation.

Among the less fortunately placed concerns is the Stalybridge, &c., Joint Tramways and Electricity Board, which has had to suspend the whole of its tramway services, and which, it is reported, is in a precarious position as regards electricity supply. The completion of an oil fuel installation at the Crown Point station of the Leeds Corporation enabled a greatly improved tramway service to be operated. At Nelson the tramways have been shut down, and in Bury a 50 per cent. reduction has been made.

The Birmingham Electricity Supply Department, which, until quite recently, did not consider it necessary to impose any official restrictions, has had to review its position, and restrictions are being made with a view to causing as little dislocation as possible. The tramway services have been reduced by 35 per cent.

On May 4th the Birkenhead authorities were temporarily unable to obtain coal in sufficient quantity to maintain the necessary head of steam for their generating plant. As a result the tramways were suspended for a period of two hours.

At Bradford a deputation representing the tramway employés interviewed the manager with regard to the curtailment of services which had been put into effect. The manager informed them that he was acting upon Government instructions, whereupon the deputation pointed out that the position of Bradford with regard to fuel did not justify such a drastic "cut." The town clerk stated that the Mines Department had powers to take action against the Corporation for any breach of the order. It has been arranged for a large number of the men to take their holidays now in order to avert "standing them off."

In Sheffield the tramway employés have been put on to a day-by-day agreement. Thus, if circumstances necessitate it they may be temporarily suspended. Eight thousand were added to the unemployed list during last week.

On May 3rd the Doncaster Electricity Committee announced that it had secured sufficient coal to run the electricity works for another fortnight.

The L.C.C. tramway services have been cut down a great deal, especially in the outer suburbs. On the "Underground" railways, economy is being effected chiefly by severe "cuts" in the Sunday train services, although the week-day services have also been curtailed. The general arrangement is for a later commencement, and an earlier cessation of services.

In addition to a great reduction in the Halifax tramway services, the electricity supply is being withheld between the hours of 11 p.m. and 6 a.m. The town clerk has been instructed to prosecute firms not complying with the 50 per cent. power reduction order.

The Yorkshire (Woollen District) Electric Tramways Co., Ltd., has adopted the policy of not running any cars before 12.45 p.m., and services are discontinued at 8.30 p.m., with an hour's extension on Saturdays.

The number of unemployed has reached appalling proportions, and it was stated at the beginning of the week that 5,000,000 workers had been directly affected by the stoppage, and that 2,000,000 of these were receiving full unemployment allowances. In London itself the number of people thrown out of work was reported to be upwards of 200,000.

The restricted supplies now being given have necessarily affected industrial concerns severely. All but three departments of the Helsby cable works have been closed. A quantity of coal from the works is being supplied to necessitous people in the district.

Further steps have been taken by the Government to conserve coal. On May 4th the Secretary of Mines issued an order for public lighting to be reduced to 25 per cent. of that employed on the same date last year, in the case of towns with a population of 5,000 or over; smaller towns were ordered to suspend public lighting altogether. Power for tramways and light railways is restricted by the order to 75 per cent. of the normal.

The renewed Order in Council extending for another month the conditions necessitated by the declaration of a "state of emergency," permitted the Secretary of State to institute a further extension of one hour of "summer time." It was decided later, however, that the small amount of fuel which would be conserved in this way did not justify any action in the matter.

A *Times* message dated May 10th said that a detachment of naval electricians and stokers had left Portsmouth that day for London. It was understood that they were detailed for duty at power stations if required.

Members of the E.T.U. at Greenwich refused to handle imported coal and were, therefore, dismissed. The secretary of the union stated that unless the men were reinstated the whole of the electrical services of London might be closed down.

The Glasgow Corporation has ordered large quantities of coal from Canada at the price of £2 18s. 6d. per ton (conditions not stated).

**The E.T.U. and Non-Union Installations.**—At last week's meeting of the Swansea Corporation Electricity Committee, Ald. Alex. Sinclair (chairman) presiding, further correspondence was read with reference to the intention of the Electrical Trades Union (Swansea Branch) to put in force a list of *bona fide* contractors for wiring purposes. The chairman explained that the law on the matter was distinct that if the wiring was approved by the local authority they were bound to carry out the connection, but the men now came in and said that if the wiring was not done in accordance with the union's regulations then they would not connect up. The Hackney Borough Council had had damages awarded against them by the magistrates before whom it was pleaded on behalf of the local authority that the reason for the default in not connecting up was *force majeure*—an act over which they had no control. The Hackney authority, however, were appealing against the decision.

Ald. Colwill (vice-chairman) pointed out that the Committee conformed to the trade union conditions in every respect, and that was all that could be reasonably expected of it. To expect the committee to watch all the outside contractors would need a little army of inspectors.

The Chairman: It would simply amount to this, that if Mr. Burr, the electrical engineer, not being on the union list of contractors, wired his own house, the union would instruct their members not to connect it up.

It was decided again to reply to the E.T.U. that the Corporation could not be expected to do more than conform to the trade union conditions as at present.

**Labour and Production.**—Sir Robert Hadfield, Bt., presided on May 4th at a dinner at the Grand Hotel given by the Council of the Iron and Steel Institute to the president, Dr. J. E. Stead. In the course of his speech, Sir Robert referred to the immense services rendered by Dr. Stead to the science of metallurgy, in which his name is and always will be a household word. They had with them, too, that evening the distinguished American metallurgist, Mr. J. A. Panton, whose labours on behalf of the science had been of the highest importance. Proceeding to allude to the present industrial troubles of this country, Sir Robert remarked that Judge Gary, the head of that wonderful organisation known as the United States Steel Corporation, recently stated that there must be reductions in wages on that side of the water. In this respect no one wished to see reductions in the income of our wage-earners less than did he (Sir Robert), but the present fictitious state of affairs, financially and industrially, made it impossible to get on a sound footing until some readjustment first took place. Mr. Panton had pointed out to him—and he wished the Labour leaders would remember this—that on, say, an 80 per cent. or 90 per cent. productive basis, that is in a steel works, for example, it might be possible to earn reasonable profits and pay reasonable dividends, say, a few per cent. The Labour leaders, however, little realised that if this production were dropped, even on a comparatively small scale, overhead charges, which were wages more or less, reared their heads, and what would have been reasonable profit became a serious loss.—*Daily Telegraph*.

**The Safeguarding of Industries Bill.**—In the House of Commons sitting in Committee on Monday, Mr. Stanley Baldwin, President of the Board of Trade, moved the resolutions for the safeguarding of British industries for a period of five years, which were published in the ELECTRICAL REVIEW for April 8th, p. 461. Mr. Baldwin, in the course of his speech, referred to the prevailing unprecedented trade conditions throughout the world, and said that they must watch the exchanges righting themselves by the natural and probably slow process of evolution, but they had to remember that this country would starve if it were not for its industries. The Government did not propose to leave things alone. There was the great danger that if nothing was done there would inevitably come into this country unchecked a flood of foreign goods at prices with which, for the time being, it would be impossible to compete. This would cause a storm of protest from the manufacturing centres which no Government would be able to resist, and the result would be the worst thing in the world—legislation of a panic nature. The speaker went on to refer to the most specific pledges that had been given with regard to something being done for key industries. The list of scheduled industries had been cut down to the narrowest limits, and he believed that every man with a knowledge of British industry to-day would see that they had in the articles scheduled the main things which went to make the scientific foundation of British industry. The prospects of the chemical industry were illimitable, and its development was absolutely necessary in such a country as ours. In that industry, as developed in Germany, and as it was hoped to develop it in this country, there was unlimited scope for brains. In this country our brains were as good as those of any people in the world, and we wanted to lose no opportunity of affording scope for them and making fields in which they could be exercised. In the Bill the support that the Government advocated was limited to five years, because they believed that at the end of that time the Government would be in a position to see whether these industries had proved themselves worthy of the support. A committee would be set up, including members of the fighting services, in order to keep in touch with the work of all these key industries and to make an annual report to Parliament. Passing to dumping, he reminded the committee that the committee which sat under the chairmanship of Sir Henry Birchenough advised that a special import duty should be levied whenever it was established that dumping was going on on a substantial scale. It was on these lines that the Bill proposed to deal with dumping. Dumping would only be dealt with when the committee was satisfied that by dumping employment in any industry in the United Kingdom was being, or was likely to be, seriously affected. But even then the duty would be imposed only for three years or less. Food and drink were specifically excluded, and it was not intended to schedule raw materials, which were very difficult things to define.

Many members took part in the discussion. Ultimately Mr. Chamberlain said that it was hoped that the first resolution would pass on Tuesday and the second on Wednesday.

At the end of Tuesday's debate an amendment limiting the operation of the proposed Bill to one year was defeated by 289 votes to 79.

The *Manchester Guardian* publishes the following:—

The Lamp Importers' Committee are making a strong protest against the attempt of the lamp "ring" to get electric lamps included in the Key Industries Bill. They regard the attempt "as one of the insidious operations of the lamp ring in this country which was definitely stated to exist by the sub-committee appointed by the Standing Committee on Trusts," and "an attempt to crush out the independent traders and electrical engineers."

The statement continues: "The high prices charged by the lamp 'ring' for home trade are denounced by the sub-committee already referred to. These high prices make the maintenance of electric light a heavy item and tend to prevent more rapid development of the use of electricity, thus denying its convenience and hygienic value to the poorer sections of the public. This retarding of development naturally restricts the manufacturers of electrical machinery, heating, and cooking, and domestic labour-saving appliances. This, we assert, is of greater importance to the community, in view of the expansion of new manufactures and exports and the openings for trade thus offered, than a trifling increase of the 'ring' manufacturers' operatives, against which must also be set the loss of employment to ourselves, office and warehouse staffs, and travellers, which would be the result of the passing of these restrictions."

In a memorandum drawn up by the British Empire Producers' Organisation and sent to the Chancellor of the Exchequer the following reference is made to the electrical industry:—

"Electricity as power is one of the most essential raw materials and so wants special consideration. Backwardness before the war was due to two causes: (1) Free imports, (2) municipal trading. No firm could extend works according to the possible demand of the Empire as the effect of free importations in this country created a demand for every system, whilst in America and Germany there was standardisation. The result was that the output of our biggest firms was only 10 or 15 per cent. of the output of the German A.E.G. or American General Electric."

**New French Companies.**—There has been formed at Lille (79, Rue Gantois) the Société des Accumulateurs du Nord for the manufacture and sale of accumulators and electric mining lamps. The company has taken over works and assets of the Société anonyme électrique de Thumesnil, in liquidation, and its capital is 1,600,000 fr. in 6,400 shares of 250 fr. each, of which 4,520 are allotted to the several contributories.

The Société industrielle des Machines et Outillage has been constituted at Paris (65, Avenue Victor-Emmanuel III) with a capital of 600,000 fr. in 250 fr. shares, of which 1,200 are allotted to M. Perree-Martin as consideration for assets.

The Société hydroélectrique de la Rance et de l'Arguenon has been established to work a hydro-electric station on the upper Rance, and another at Gueldo on the Arguenon, the latter using the hydraulic power of the tides. The original capital of 3,000,000 fr. will be raised to 14,000,000 by successive issues, of which 8,000,000 fr. may be in bonds; 2,000 500-fr. shares of the original issue are offered to the dwellers in the district, so that they may participate in an undertaking which closely concerns their interests.

With a capital of 200,000 fr. the Société de Production et d'Exportation Sidérurgiques has been formed at Paris (94, Rue de la Victoire) for trade in all branches of mechanical and electromechanical production.

**Canadian Electrical Manufacturing Industry.**—The Dominion Bureau of Statistics has issued a preliminary report covering the year 1919 on the electrical apparatus manufacturing industry in Canada. Ninety-five plants are specified, of which 64 are in Ontario, 16 in Quebec, and the remainder scattered throughout the other provinces. The investment in the Province of Ontario is $25,500,000 and in the Province of Quebec $20,000,000. The total Canadian investment is $45,956,399. The value of goods turned out by the 95 factories in question was slightly less than $35,000,000.—*Electrical News*.

**Foreign Trade.**—April Figures.—The following are the values of imports and exports of electrical goods and machinery in April :—

| | April, 1921. | Inc. or dec. | 4 months, 1921. Inc. or dec. |
|---|---|---|---|
| Imports. | £ | £ | £ |
| Electrical goods, &c. | 211,013 | + 107,727 | + 537,611 |
| Machinery ... ... | 1,028,778 | − 854,384 | − 838,902 |
| Electrical machinery | 52,167 | − 34,164 | − 43,051 |
| Exports. | | | |
| Electrical goods, &c. | 1,436,109 | + 679,580 | + 1,981,966 |
| Machinery ... ... | 7,784,302 | +3,732,639 | +15,596,736 |
| Electrical machinery | 422,757 | + 239,272 | + 1,037,040 |
| Re-exports. | | | |
| Electrical goods, &c. | 25,180 | + 11,658 | + 76,776 |
| Machinery ... ... | 94,805 | − 28,218 | − 33,104 |
| Electrical machinery | 3,696 | + 1,724 | + 7,967 |

**Joint Industrial Councils.**—We have received from Mr. W. Arthur Jones, general secretary of the Electrical Power Engineers' Association, a copy of a letter addressed on behalf of his Executive Council to the Town Clerk of Hammersmith with regard to the recent resolution of that Borough Council to discontinue its association with the Joint Industrial Councils concerned with conditions of employment and rates of remuneration for the several sections of the Council's staff and employés, &c. Apparently the objection of the Council to taking part in the future work of such bodies is based on the fact that its connection with the various Whitley Councils places it under an obligation to apply the awards which are formulated. Mr. Jones points out, however, that "only in so far as agreements arrived at by the regularly constituted machinery in the industry are honoured, can there be any reasonable possibility of industrial peace being maintained. It is because both the Government and the public at large have recognised the necessity for industrial peace, and the importance of preventing possible disputes crystallising into antagonism and culminating in strikes, that they have consistently advocated that the old bad methods of individual bargaining should be replaced by machinery whereby all questions affecting the employés can be amicably settled around a table in a spirit of mutual trust and confidence.

"Your Council cannot but be aware that the effect of Whitley Councils in the electricity supply industry has undoubtedly been to effect a diminution in the number of disputes, and as more experience is acquired, these good results will become more apparent.

"The inevitable outcome of a secession such as your Council contemplates will lead to the moral damaging of the whole scheme, and will tend to bring about the return of the chaotic conditions which prevailed before the war.

"It may be that your Council has been obsessed with the fact that up to the present Whitley Councils have been concerned with the question of wages. Perhaps, under the circumstances, this has been inevitable. It is, however, the desire and intention of this Association that Whitley Councils in the electricity supply industry should devote their attention to the larger questions, such as the efficiency of the industry as a whole, and that they should be made a means whereby those who are engaged in the industry should make their definite contribution to its more efficient administration. The breaking up of the Councils by such action as your Council proposes to take will effectively prevent this, to the grave detriment of the industry."

**Catalogues, &c., for Chile.**—In a recent dispatch to the Department of Overseas Trade, the Commercial Secretary to H.M. Legation at Santiago makes the following comments in connection with the translation into Spanish of catalogues, pamphlets, leaflets and other printed matter sent by United Kingdom manufacturers and exporters to firms in Chile :—

"The title or most conspicuous word should be in Spanish and not in English. Unless this is so, even when the subsequent material is in Spanish, very little gets read. As every firm of any standing in the country receives a mail bag full of advertising matter by each mail, it is obvious that with such a collection to choose from it is only the Spanish reading matter that will receive any attention. It is most important, therefore, that upon taking off the postal cover the most striking wording which reaches the eye shall be in Spanish. This at once places it amongst the few to be read instead of the many which are consigned to the nearest wastepaper-basket."

**The Erection of Meter Boards: Trade Union Dispute.**—It was recently reported that the joiners employed by the Swansea Electricity Department had, on the instructions of their society, ceased to erect meter boards, on the assumption that they were not being made under trade union conditions. Correspondence was read from the society admitting that the real facts were not clearly known, and from the firm at Treorchy supplying the boards to the effect that the trade union rates and conditions were being strictly observed. Mr. Bevan (printer) complained that the society had not first obtained the information before stopping the men. That was the sort of thing that brought trade unionism into disrepute. Mr. Clarry considered it a very high-handed action, and thought the society should be asked to apologise. Mr. Miller (joiners) said the society placed the onus upon the manufacturer to prove that the work was done under trade union conditions. It was explained that the men had not actually ceased work, as they were putting up meter boards that were made in the workshop. Incidentally, it was stated that the cost of making them had been 19s., and the price to buy them 9s. 6d. It was resolved to instruct the men to put up the meter boards in question.

# LIGHTING AND POWER NOTES.

**Aberdeen.**—Electricity Supply.—At a meeting of the Electricity Committee, a letter from the Banff and Macduff Town Councils was read, asking that the city electrical engineer might be allowed to advise them upon the question of an electricity supply for the two towns. The Committee recommended that the Council should express its agreement.

**Argentina.**—Additions to Large Station.—The Compania Hispano-Americana de Electricidad, which owns two electricity generating stations in Buenos Aires with a total capacity of 110,000 kW, is putting down two more 25,000-kW turbo-generators in order to meet the increasing demand for power.

**Barrow.**—Direct Labour.—In connection with recent complaints received from the Secretary of the local branch of the Electrical Trades Union, with regard to wiring work which was being carried out in the borough by members of the Union and others who were normally employed at the shipyard, during their spare time, or when they were unemployed, it was decided by the Electricity Committee that Corporation wiring work should be done by direct labour.

**Blackburn.**—Applications for Power Refused.—The Electricity Committee has decided not to grant the applications from Billington Parish Council and Oswaldtwistle Urban District Council for the supply of power from the new station. A Committee was appointed to deal with the application of Blackburn Rural District Council.

Cost of New Station.—At a meeting of the Town Council on May 5th, Mr. L. Bates asked the original estimate for the new electricity generating station. He was under the impression it amounted to £250,000, and he believed the cost now would be nearer £800,000. The town clerk replied that the original estimates were for a much smaller station.

**Bolton.**—Delayed Extensions.—At a meeting of the Town Council, reference was made to the decision of the Electricity Committee to delay extensions at the Back-o'-th'-Bank Works in order to curtail expenditure. In view of the statement a year ago as to the urgency of these extensions, it was thought the public ought to be given a reason for holding them up. Councillor Roberts said the extensions were in two sections. It was only the second section which was being held up. The first would see them through the winter and well into next year. Last year the Committee sold over 30,000,000 units, but unless there was an early resumption of trade they would have to face a reduction of output of from 5 to 10 per cent.

**Boston.**—Provisional Order.—The Town Council has received a letter from the National Electric Construction Co., which holds the Boston Electric Lighting Order, 1915, stating that there is no prospect of proceeding with the work at the present time.

**Burnley.**—Mains Extensions.—Burnley Electricity Committee has authorised several extensions of electricity mains, the cost to be defrayed out of a loan of £20,000 sanctioned by the Commissioners.

The electrical engineer has reported the receipt of complaints from Reedley Hallows Council regarding the unsatisfactory electricity supply. He stated that to improve the supply it would be necessary to lay an additional feeder cable a distance of 1,200 yards, at a cost of £1,800. Consideration of the question was deferred for the present.

**Canada.**—Prince Edward Island.—The *Electrical News* states that the Prince Edward Island Light, Heat, and Power Co. has asked for incorporation by the local legislature, which is meeting at present in Charlottetown. The capital stock is $2,000,000, and it is planned to supply light, heat, and power to all parts of the island from one big central power house, using coal to generate electricity. The incorporators include Mr. H. A. Sanders, of London.

**Carlisle.**—Expert Advice.—The Electricity Committee has passed a resolution to retain the services of a consulting engineer, to be nominated by the President of the Institution of Electrical Engineers, to advise upon the present position of the electricity undertaking and make recommendations for meeting future demands upon the works.

**Consett (Co. Durham).**—Free Lighting.—It was reported at a meeting of the Urban District Council that for a period of 21 years from 1911 the Cleveland and Durham County Electric Power Co. was under agreement to supply free electricity for lighting the town up to 1,098,000 units; 916,699 units were still available, and on last year's basis of consumption this would be sufficient to light the district for another 21 years.

**Continental.**—France.—In order to meet the increasing demand for electricity for lighting and power purposes, the Compagnie Centrale d'Energie Electrique is increasing the capacity of its generating station at Rouen by the addition of two new 10,000-kW steam turbo-alternators. The output of the plant last year reached a total of 46,087,950 kW-hours.

Turkey.—La Société Ottomane d'Electricité is increasing the capacity of the generating station in Constantinople by the addition of a new 10,000-kW steam turbine and alternator. The number of clients supplied increased during last year from 12,894,

representing 15,594 kW to 17,207 (18,657 kW), the output of the station during the 12 months amounting to 29,588,900 kW-hours, an increase of nearly 4,000,000 kW-hours over 1919.

FINLAND.—The Government is at present investigating the possibilities of generating power from the Imatra Falls on the Vuoksen River in East Finland. The idea is to connect several smaller falls above Imatra, build an embankment, and thus obtain a head of about 24 metres. The power station, with eight horizontal turbines, is to develop 150,000 h.p. The carrying out of this project will entail large excavations and blasting operations, especially as regards the construction of the canal—1 km. in length—which is to convey the vast volume of water from the granite-built embankment to the power station, and, according to the estimates made, about 700,000 cb. metres of earth and rock will have to be removed. It is estimated that all this will cost about 267,000,000 Finnish marks. At present the work is only being planned, but there is no doubt that sooner or later it will be carried out. There is already a railway to the falls, which are situated in a well-populated district, whilst the nearest port, Wiborg, is not more than 50 km. distant. The power generated will most probably be used on the railways.—*Times Trade Supplement.*

**Dartford.** — LOAN SANCTIONED. — The Urban District Council has received sanction to a loan of £12,106 for additions to the electric plant and mains extensions, and an additional loan of £4,562 has been applied for owing to increased costs.

**Dublin.**—PUBLIC LIGHTING SUSPENDED.—The Lighting Committee has decided to suspend from May 9th to September 30th the whole of the city public lighting, arranging, however, that the order may be modified to suit, in the event of the curfew regulation under martial law (from 10 p.m. to 5 a.m.) being altered. The coal situation was the chief factor determining the action. Electric lighting in the Rathmines (Co. Dublin) district was suspended last week-end, owing to a strike of municipal workers upon a question of hours.

**Egham and Staines.**—PRICE REDUCTION.—The *Evening News* announces that the cost of electricity is to be reduced by 10 per cent.

**Electricity District.**—NORTH LANCASHIRE AND SOUTH CUMBERLAND.—The Electricity Commissioners give notice that the time within which objections or representations may be made or schemes submitted in connection with the above-named district has been extended from the last day in April to July 30th, 1921.

**Fermoy.** — ELECTRICITY CANVASS. — The local Co-operative Society recently notified inhabitants that it had decided to install a generating plant at its mill premises, and wished to know how many people would take electricity. It is reported that the canvass has been successful, and the scheme is to be proceeded with.

**Gosport.**—COMPANY'S INABILITY TO SUPPLY.—Many complaints have been made by would-be electricity consumers who have had their premises wired only to be informed that the Tramway and Lighting Co. was unable to give them a supply, says the *Hampshire Telegraph*. The Act under which the company works, imposes a penalty of 40s. for each day of default. The manager of the company has explained, however, that the trouble is due to the non-delivery of new plant, owing to war conditions and labour disputes, and that when it is installed it will enable the company to supply three times as much power as it has to provide at present. For the last 18 months the plant has been running with an 80 per cent. overload.

**Horbury.**—ELECTRICITY SUPPLY.—The Urban District Council has passed a resolution approving of the granting of an order by the Electricity Commissioners authorising the Electrical Distribution of Yorkshire, Ltd., to supply electricity for all public and private purposes within the urban district of Horbury.

**Hull.** — SEED AS FUEL. — It was reported in the *National News* that a local oil manufacturing firm had offered the Hull Coal Controller 400 tons of damaged cotton-seed, suitable for fuel, and that the offer had been passed on to the city electrical engineer.

OIL FUEL.—At a meeting of the Hull Coal Emergency Committee, the electrical engineer (Major H. Bell) said that oil fuel was being utilised up to 50 per cent. of the power station's requirements, but it was two or three times as costly as coal.

**Lamberhurst (Kent).**—SMALL WATER-POWER PLANT.—The town mill is being converted into a generating station, with motive power obtained from the river Teise, by Colonel F. G. Delamain. Electricity will be supplied to consumers in the village at 1s. per unit.

**Lincoln.** — LOAN WITHDRAWAL. — The *Manchester Guardian* states that the Lincoln Corporation is withdrawing its application for sanction to borrow £67,000 for further contracts in connection with the extension of the electricity undertaking.

**Liverpool.**—EXTENSIONS.—The City Council has approved of building operations being continued at the Lister Drive No. 1 Power Station, subject to specified conditions.

INSTALLATIONS DELAYED.—There is a delay with regard to the installation of electricity in new houses which are being built by the Corporation, owing to the Ministry of Health declining to bear the cost. Negotiations are still proceeding on the subject.

**London.**—BETHNAL GREEN.—The Borough Council has received sanction to borrow £54,143 for extensions.

HACKNEY.—The Electricity Committee has drawn up a revised scale of charges which the Council is asked to approve. Included in this scale is an increased minimum charge of 13s. 4d., instead of 10s. Lighting is to be charged for at the rate of 1s. per unit for any quantity not exceeding 91 units per kW demanded and 2d. per unit thereafter. The alternative charges for power are as follows:—£2 per quarter per kW demanded, and 1½d. per unit, or a flat rate of 3½d. per unit; 2½d. per unit is recommended for heating, cooking and other domestic purposes.

**Manchester.**—CHEAPER ELECTRICITY FORESHADOWED.—At a recent meeting of the Electricity Committee it was announced that a surplus was expected to be made during the current financial year, and, as soon as working costs fell sufficiently, charges to consumers would be revised and lowered.

**Newport.**—ISSUE OF STOCK.—The Town Council has resolved to raise £600,000 in 6 per cent. redeemable stock, the bulk of which is to be spent in new public works, including £121,982 on account of electricity supply extensions, £48,628 on account of tramways, and other sums for bridge work, &c.

INQUIRY.—A local inquiry is to be held into the application of the Corporation for permission to extend its electricity scheme to the parishes of Bedwas, Malpas, and Duffryn. At present the Corporation is entitled to charge 9d. as a maximum, but it is negotiating for powers to charge 10d. if the necessity arises.

**South Africa.**—GOVERNMENT CONTROL OF ELECTRICITY SUPPLY.—The *British and South African Export Gazette* says that although only very meagre particulars are available regarding the Bill which is shortly to be presented to the Union Legislature to deal with matters concerning the supply of electric light and power, it is already evident that the measure will not have an altogether smooth passage. Some considerable degree of Government control of electricity undertakings is proposed, and, as a natural corollary, legislation will have to be enforced to provide for the bringing of existing schemes up to one standard of efficiency. This must necessarily involve heavy expenditure on alterations and improvements, and it seems to be on these grounds that the opposition is chiefly based; the view expressed by General Smuts in a pre-election speech is that such unification is in the best interests of power development in South Africa. Though it will doubtless cause a fluttering in municipal dovecotes, it will at the same time stimulate the use of electric light and power among consumers who in the past have often been not a little critical of the treatment meted out to them by virtual monopolists, and consequently should materially increase the demand for plant and accessories, from generating machinery to domestic fittings.

BURGHERSDORP.—The Municipal Council proposes to borrow £12,500 for the provision of an electricity supply scheme for public and private lighting purposes.

**Stretford.**—EXTENSIONS APPROVED.—At a meeting of the Urban District Council receipt was reported of the consent of the Electricity Commissioners to the extension of the Trafford Park station by the installation of one 5,000-kW set and accessory plant, and by the necessary building extensions. Preliminary sanction has also been given to a loan in respect of the foregoing extension, as follows:—Plant, £70,000; mains and services, £30,000.

**Torquay.** — CONSULTANT CALLED IN. — Mr. E. T. Ruthven-Murray is to be asked to advise the Council as to the possibility of installing steam-raising plant on the present site. In the meantime, the electrical engineer has been authorised to repair an economiser at an approximate cost of £1,250. This renewal is necessary, in the opinion of the engineer, to carry the station through until another supply becomes available.

**Walsall.**—LOAN SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing of £107,600 by the Town Council, in respect of the completion of the electricity works at Birchills.

**Walton-on-the-Naze.**—PROPOSED PURCHASE OF UNDERTAKING.—The Electricity Committee reported at a recent Council meeting that negotiations were still proceeding for the purchase of the local undertaking owned by the Coast Development Co. The clerk had interviewed the Electricity Commissioners, and hoped to be able to submit a draft contract very shortly. The liquidators had asked if the Council could provide financial assistance to enable the undertaking to be carried on, but it was decided not to take any action in this matter.

**Weybridge.**—PROPOSED PRICE INCREASE.—On May 3rd, Colonel T. C. Ekin, of the Ministry of Transport, conducted a public inquiry into the application of the Urban Electric Supply Co. to increase the price of electricity at Weybridge and Walton from 10d. to 1s. per unit. There was opposition on the part of the Weybridge and Walton Urban District Councils.

**Whitby.**—LOAN.—The Urban District Council has applied for sanction to a loan of £2,300, for meters and a spare feeder.

**Worcester.**—ELECTRICITY FOR HOUSES.—After a great deal of discussion, the City Council decided, on May 2nd, not to supply electricity as well as gas to the houses on the Bromyard Road site.

Councillor Mrs. Edwards, a Labour representative, advocated electricity in view of the lowness of the ceilings in the houses under consideration.

**Worksop.**—Extensions.—The Council is contemplating the expenditure of about £24,000 on extending the electricity supply of the town. Among the works to be carried out is the provision of the necessary plant and mains to deal with a bulk supply from the Manton Colliery, which is to be taken as an alternative to extending the municipal undertaking.

## TRAMWAY AND RAILWAY NOTES.

**Argentina.**—Railway Commenced.—His Majesty's Consul at Antofagasta (Mr. H. W. W. Bird) has informed the Department of Overseas Trade that according to the local press a start has been made by the Argentine Government at Salta on the preliminary work in connection with the railway projected to run *viâ* Huaitiquina on the frontier to Antofagasta. The plans of a French company which made the surveys some years back have been acquired.

As regards the Chilean section, which is roughly a half of the projected railway, nothing has been decided.

**Belfast.**—New Plant.—Owing to the increased services upon the Antrim Road route to Bellevue Gardens, it has become necessary to install additional plant at the Salisbury Avenue station, and the Tramways Committee recommends application for sanction to borrow £14,000 for this purpose.

**Bradford.**—Breakdown.—On May 4th the tramway services, already cut down by the fuel shortage, were dislocated on the Southfield Lane, Banktop, Queensbury, Wibsey, Bankfoot, and Wakefield Road routes, owing to failure of power in the two trunk cables at 9.15 a.m., just when cars were returning to the depôt for the suspension of the service until noon. Several cars could not be moved from the city termini, and the defects were not entirely rectified during the remainder of the day, though some of the cars were removed by an emergency electricity supply from the Odsal sub-station.

**Burnley.**—Grant Refused.—The Unemployment Grants Committee has refused to make a grant to the Tramway Department for the relaying of the tramway track.

**Bury.**—Year's Working.—For the year ended March 31st last there was a loss on the tramway undertaking of £10,872 on the Bury section, and of £1,948 and £650 on the Radcliffe section.

**Continental.**—Spain.—La Société des Tramways et Electricité de Bilbao has contracted with the Sociedad Hidro-Electrica Iberica for the supply of all the power necessary for the electric tramways in Bilbao. It has also sold to the Iberica Co. the 7,000-kW power station established at Burcena in 1908-11. The station, which is steam-operated, will serve as a reserve to the Iberica Co.'s water-power plants.

To remedy the growing congestion of traffic in Barcelona, which the tramways are unable to deal with, it is proposed to build an underground railway, or, as it is termed, a "Metropolitano." A company has been formed, on the board of which are some of the most distinguished Spanish railway engineering experts, assisted by M. Lorton, the director of the Paris Metropolitain. Besides relieving the local congestion, the Metropolitano will be linked up to the several railway companies converging on the city, whose through goods traffic will be speeded up by the use of the lines of the railway during the night.

Switzerland.—Owing to the mild winter and the decrease in wages and in the price of materials, the electrification of the Saint Gothard Railway is proceeding in a most satisfactory manner. It is hoped that the Bellizona-Lugano-Chiasso section will be in working order by October. The double line between Giubasso and Sasso should be completed by the same time. By the end of the year the Erstfeld-Aarth-Goldau section and the Aarth-Goldau-Chiasso section are expected to be electrified.—*Reuter's Trade Service* (Zurich).

**Dearne District.**—Light Railway Scheme Approved.—The *Sheffield Independent* understands that the Ministry of Transport will confirm the Dearne District Light Railways Order, 1920. This Order authorises the Urban Councils of Wombwell, Wath-on-Dearne, Bolton-on-Dearne, and Thurnscoe, acting jointly, to construct and undertake a system of light railways connecting a number of colliery townships in the Dearne Valley. The trunk line is to be carried from the Barnsley borough boundary through Ardsley, Wombwell, Wath, Bolton, and Goldthorpe, to Thurnscoe, with branches to Darfield and Swinton. The Order limits the capital to be raised under its authority to £300,000.

**Doncaster.**—New Track.—After an interview by the town clerk and the borough surveyor, at the Ministry of Transport, the Tramways Committee recommends that the surveyor be authorised to proceed with the doubling of the tramway track from the junction of Cleveland Street and St. Sepulchre Gate to Balby Bridge, and that negotiations be opened for the purchase of a strip of land for the widening of Balby Road.

**Durham County.**—Transport Scheme.—At a meeting of the County Council, on May 4th, the Chairman, referring to the rejection of the Council's Transport Bill, said the Bill had been strangled at its birth. They were not going to take it lying down, and had made up their minds to go on preparing the ground so that they might be able in the future to provide the county with a greatly improved transport service.

**Gateshead.**—Option of Purchase.—The opinion of the Corporation is divided upon the question of taking over the tramway undertaking next year when the next opportunity falls due. Unofficial estimates give the amount required for purchasing the whole system as £1,500,000. Another 14-year period will elapse before the option can be exercised again.

**Llanelly.**—Electric Vehicles.—At a meeting of the Borough Council, on May 2nd, it was decided to seek sanction to a loan of £2,300 for the purchase of two electric lorries.

**London.**—Track Renewals.—Evidence of the efforts of the L.C.C. Highways Committee to make up for time lost during the war is given by a recent statement that the rate of relaying old tramway lines is now 26 miles per year, which is considerably above the pre-war average. Only about 4 miles per year were laid during the war period.

Breakdown.—On the evening of May 5th trains between Richmond and Broad Street, on the North London Railway, were held up for nearly an hour, owing, it is stated, to the breaking of a conductor rail.

**Rawdon (Yorks).**—Repairs Demanded.—In addition to protesting against the Leeds Tramways Committee's proposal to apply for sanction to increase the statutory maximum fare to 2d. per mile, the Rawdon District Council has called upon the Leeds Corporation to repair the tramway in the Rawdon area, and to improve the car service.

**Shipley.**—Abandoned Extension.—At a meeting of the District Council, on May 5th, the chairman of the Highways Committee reported that as it appeared that the scheme for the extension of the Bradford tramways through Shipley to Baildon had been abandoned, the Committee had invited tenders for the purchase of the rails and points purchased by the Shipley Council nearly 10 years ago for use on this extension. The Council confirmed the action of the Committee.

In the above matter it is hardly correct to say the scheme has been abandoned by Bradford. In 1911 the Baildon Council asked Bradford Corporation to extend the tramways from Shipley, the Baildon Council offering £50 per year for 10 years. The Corporation could not agree to this, and it was decided eventually that the Baildon Council should apply for a Provisional Order, and that Bradford should construct the line. The Order was secured, and Bradford arranged with the Shipley Council to undertake the construction of a short length of track from the present Shipley terminus to the centre of the river bridge, at a cost of £650 in materials and labour. The war held up the scheme, and Baildon Council failed to renew the Order within the time allowed.

**Uruguay.**—Overhead Tramway.—It is announced that a project for the installation of an aerial tramway between the Old Town district of Monte Video and the Cerro, is shortly to be presented to the Municipal authorities. The motive power for this installation would be obtained from the State Electrical Department, and it is intended that the fares shall be the same as those charged by the existing ordinary tramway between the two points named. The author of the scheme is Senor Francisco Piria. He is asking for a concession for 25 years, after which period the whole installation would become the property of the Municipality.—*Review of the River Plate.*

## TELEGRAPH AND TELEPHONE NOTES.

**Dutch East Indies.**—Wireless Service.—It is announced from Washington that a commercial wireless service between the United States and the Dutch East Indies has been established.

**France.**—Wireless Invention.—Prof. Lippmann, lecturing at the Academy of Sciences, on May 9th, described an invention of MM. Abraham and Planiol for utilising ordinary telegraphic apparatus for sending, receiving, and printing wireless messages. Prof. Lippmann said that experiments made before a number of official experts between Paris and Nogent le Rotrou had given brilliant results, and that as many as 7,000 words had been automatically registered in one hour.—*Reuter's Trade Service* (Paris).

**Norway.**—Telegraphic Communication.—On the proposal of the Norwegian Telegraphic Board that the telegraphic connection between Finland and Norway should be *via* Petsamo, the President of the Republic of Finland has decided that the line of telegraphs through Petsamo may be used for the purposes of this connection, provided that the charges payable to the Finnish State shall be at the rate of 11 centimes per word.—*Economic Review.*

**South America.**—Telephone Service.—A public telephone service between Parana and Crespo (Prov. of Entre Rios) was inaugurated on April 4th. The line has been constructed by the Compania Entrerriana de Teléfonos.—*Review of the River Plate.*

New Argentine Wireless Company.—A Germano-Argentine company has been organised, under the name of Compania Radio-telegráfica Transcontinental, with head offices at Buenos Aires, with the object of establishing wireless communication between Europe and South America. It will have a share capital of 10 million pesos, of which 3,000,000 pesos of 7 per cent. preference shares and 4,500,000 pesos of ordinary shares are already on the market. The preference shares were subscribed for in Argentina, and the ordinary ones were taken by a German syndicate formed by Siemens & Halske, the A.E.G., and the German South African Bank. The board of directors is composed of principals of these companies. The new company, which has received from the Argentine Government a concession to adopt the German "Telefunken" system, will proceed with the immediate erection of a wireless station within the Argentine, in connection with the German station at Nauen. The undertaking seems to be mainly German, and has as its declared object the development of commercial relations between Germany and Argentina.—*Ingenieria Internacional.*

**South Africa.**—Wireless Telephony.—The Government is experimenting with wireless telephony with the view of linking the chief centres. Communication has been successfully established between Johannesburg and Bloemfontein. It is hoped to extend the system gradually, thus lessening the cost of ordinary telegraphic and telephonic working, which is unusually high owing to maintenance charges over immense distances.—*Financial Times.*

**Sweden.**—Ships' Wireless.—The obligation imposed by the British Merchant Shipping Wireless Telegraph Act on shipping of over 1,600 tons burden to carry a wireless outfit is meeting with opposition in Swedish merchant shipping circles. It is urged that it is difficult, or impossible, under existing circumstances to obtain both the apparatus and the trained staffs. A petition has been forwarded to the Swedish Ministry of Marine asking that steps may be taken to secure from the British authorities exemption from this obligation till the end of the current year, on proof of inability to conform to the law.

**Telephone Service.**—Public Call Boxes.—It is pointed out by the *Star* that if a telephone call box in many of the London railway termini is used, it is necessary to pay 4d. for a call within the 10-mile radius of Charing Cross. Yet at a call box outside the stations the charge remains at 3d., for which the following explanation is given:—The call boxes in the majority of large railway termini are "not public boxes at all," but belong to the railway companies, and the calls go through the railway companies' private exchanges to the Post Office. Until the advent of the revised charges, the call rate to the public was the same as in the Post Office's own boxes, but the railway companies have agreed to charge an extra 1d. on the minimum charge of 3d. The Postmaster-General's arrangement with the railway companies only ensures that they do not undercut the general call-box rate.

The market town of Wincanton, Somerset, is still without a telephone, local business men having refused a scheme involving a £38 a year subscription, says *The Times.*

**Wireless Telegraphists.**—Wage Reduction.—The Association of Wireless Telegraphists, reports the *Daily Herald*, is faced with a reduction of wages for its members of £2 per month, and has agreed to the case going to arbitration. A meeting of the Association officials with the conciliation officer of the Ministry of Labour was held on the 6th inst. to arrange for the hearing of the case, and a joint meeting of the Union and the employers to consider procedure will be held within a few days. Pending the decision of the Arbitration Court, it has been agreed that there shall be no alteration in wireless telegraphists' wages.

## CONTRACTS OPEN AND CLOSED.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* Electrical Review *in which the "Official Notice" appeared.)*

### OPEN.

**Australia.**—Melbourne.—June 15th. Victorian Government Railways. 50 oil-immersed single-phase track and signal transformers for power signalling (Contract No. 33,901).*

June 22nd. One electric lifting magnet (capacity ½ ton), one 440-V motor generator.

June 29th. Supply of 1-ton platform type industrial storage battery trucks, also battery-charging equipment.

August 10th. 250 core-type impedance bonds for power signalling, with a capacity of 1,000 amperes per rail; also 50 miles of solid insulated copper wire, No. 14 Brown & Sharpe gauge, and 50 miles of solid insulated copper wire, 16 standard gauge.

August 17th. 3,000 sets of renewals for caustic soda primary cells.

August 30th. Board of Works. Four electrical centrifugal pumps, each with a capacity of twelve million gallons daily.

**Aldershot.**—May 24th. Urban District Council Electricity Department. Three miles of 6,000-volt, 3-phase cable. (See this issue.)

**Belgium.**—Brussels. May 26th. Municipal authorities of Schaerbeek. Fifty-five section boxes and 130 junction boxes required in connection with the electricity supply system. Particulars may be obtained from the Service de l'Electricité, Hotel Communal. Tenders to the College des Bourgmestres et Echevins, Hotel Communal, Schaerbeek, Brussels.

May 27th. Supply and erection of ten electric capstans for sluice doors. Service d'Etudes et de Controle des Applications de l'Electricité, 52, Boulevard du Régent, Brussels.

Antwerp.—May 27th. Municipal authorities. Paper-insulated telegraph cables required in connection with the fire brigade service. Particulars, 1 franc, from the Service Electrique, Hotel de Ville, Antwerp.

**Dundee.**—Corporation. Electric lighting fittings for new City Hall and for the supply of kinematograph and appliances. Mr. Jas. Thompson, city architect.

**Edinburgh.**—May 26th. Electricity Department. E.h.p. and l.p. switchgear for sub-station. (April 29th.)

Corporation. Electrical work in connection with the Corporation's Wardie housing scheme (360 houses). Plans by Messrs. Robertson & Swan, architects, 29, Hanover Street, Edinburgh.

**Fiji.**—Suva.—June 30th. Municipal Council. One 200-kW, 480/520-V, 3-wire, d.c. generator, directly coupled to a 300-h.p. vertical Diesel oil engine, with accessories and generator panel. Specifications (21s.) from the Town Clerk, Suva, Fiji, c/o Box 2,537, G.P.O., Sydney.

**Glasgow.**—May 31st. Electricity Department. Cables (including small i.r. cables and flexibles) and meters for twelve months. (See this issue.)

**Huddersfield.**—May 28th. Electric light installation in United Methodist Church and School, Outlane. Mr. F. Roberts, Maplin Lea, Lindley Moor, Outlane.

**Lochgelly (Fife).**—Town Council. May 21st. Electric installation for 40 houses. Specifications from Mr. A. D. Haxton, architect, 3, High Street, Leven. Tenders to Mr. R. Small, Town Clerk.

**London.**—Shoreditch.—June 7th. Electricity Department. Constructional steel and ironwork building, 20-ton weighbridge, h.p. steam pipes, valves, &c., for Whiston Street generating station. (See this issue.)

**Mexborough.**—May 21st. Urban District Council. Electricity Department. One 750-kW rotary converter with transformer. (May 6th.)

**Newcastle-on-Tyne.**—May 17th. Electricity Supply Department. Half-a-mile single, l.p., lead-covered, steel-armoured main cable. (May 6th.)

**New Zealand.**—June 28th. Public Works Department. Ten s.p. oil-filled transformers for the conversion of three-phase current at 50 cycles, the voltage ratio being 50,000/11,000, for Waikato power scheme.*

June 28th. Supply and delivery at Lyttelton of two 50-kVA, two 100-kVA and two 200-kVA condensers in connection with the Lake Coleridge electric power supply (Section 116).*

**Sale.**—Urban District Council. Electricity Department. Converting plant, complete with e.h.p. and l.p., d.c. switchboards. (May 6th.)

**South Africa.**—July 5th. Electrification of Capetown-Simonstown and Durban-Maritzburg lines.

**Southampton.**—May 14th. Electricity Department. 3-phase, 6,000-V cable. (May 6th.)

**Wimbledon.**—May 25th. Electricity Committee. H.p. sub-station switchgear. (See this issue.)

**Worcester.**—The Housing Committee is inviting tenders for the installation of electric light to the 111 houses on the Northwick housing site.

* A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

### CLOSED.

**Bradford.**—Electricity Committee:—

One 1,000-kVA transformer for Valley Road works sub station, £1,977.—British Electric Transformer Co., Ltd.

Tramways Committee.

Points and crossings, for renewal of track at Otley Road and Barkerend Road junction, £3,110.—Hadfields, Ltd. (Sheffield).

**Canterbury.**—Town Council:—

"Garrett" 2½-ton type electric street-watering van, £1,807.—Agricultural and General Engineers, Ltd.

**Doncaster.**—Town Council:—
Hand-operated travelling crane, £331.—Herbert Morris, Ltd.
Steam piping, £193.—Alton & Co.

**Edinburgh.**—Portobello power station:—
Pump-house foundations, £11,345.—Messrs. J. Best & Sons.

**Gainsborough.**—Urban District Council:—
Electric tipping wagon, £1,324.—Mossay & Co., Orwell.

**Gillingham (Kent).**—Town Council. Wiring 62 houses for electric lighting:—
W. McDonald, subject to conduit tubing (accepted), £717.
Evans Bros. (in steel conduit), £760.
A. E. Hornaby & Co., in solid-drawn tubing, £761; in Henley's system, £739.
W. J. Fosh (system not stated), £720.
W. G. James & Son (solid-drawn conduit), £734; Henley's system, £937.
A. Merritt (solid-drawn tubing), £895; as above, with welded tubing, £862; brazed tubing, £837; Henley's system, £721.

**South Africa.**—Cape Town.—The Corporation has recently placed an order with Messrs. Reunert & Lotz for a Babcock and Wilcox water-tube boiler, rated at 35,000 lb. of steam per hour. The price of the whole set erected, but excluding chimney and draught plant, is £20,000.

**Swansea.**—The Corporation Electricity Committee was informed by Messrs. Hornby & Co., agents for the Siemens-Schuckert meters, that these were already in stock in London and that the 50 per cent. tax did not apply. The firm added that in any case their prices were inclusive of all charges, they themselves being responsible for the payment of the 50 per cent. or any other tax by the Customs. On the motion of Mr. Clarry, it was decided that as no tax went to the Government the Committee purchase the British meters at 16s. per meter extra cost from Messrs. Chamberlain & Hookham, Ltd.

## FORTHCOMING EVENTS.

**Physical Society of London.**—Friday, May 13th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

**Chemical Society.**—Thursday, May 19th. At Burlington House, Piccadilly, W. At 8 p.m. Ordinary scientific meeting.

**Roentgen Society.**—Thursday, May 19th. At the University College, Gower Street. At 8.15 p.m. Silvanus Thompson Memorial Lecture, "Electrical Instruments and Phenomena in Physiology," by Prof. A. V. Hill, F.R.S.

**Junior Institution of Engineers.**—Friday, May 20th. At Caxton Hall, Westminster, S.W. At 8 p.m. Lecturette, "Liquid Fuels," by Mr. A. Arnold.

## NOTES.

**Swansea Salaries.**—An example of the confusion attending the contrary decisions of the National and District Joint Boards was forthcoming at last week's meeting of the Swansea Electricity Committee, when a letter was read from the secretary of the District Joint Board containing a resolution recommending that the constituent bodies should reduce the salaries in the area so as to correspond with the fall in the cost of living. The chairman, Ald. Sinclair, said that this was a case in which the District Board was in disagreement with the National Board, which claimed that there shou'd be no revision. They in Swansea followed the District Board's schedule, and the reduction in Swansea was in operation from April 1st. A letter was read from the Electrical Power Engineers' Association saying that the reduction of salaries for the quarter commencing April 1st was in direct opposition to the decision of the National Board, and entering a protest. The Committee decided to reply that the protest should be sent to the District Joint Board.

**New Aerial Torpedo.**—M. Demblanc, a French engineer specialising in aeronautics, has perfected a new aerial torpedo, which can be released from either an airship or an aeroplane. The weight of explosives, borne through the air on a gradually descending path by a system of sustaining planes, is said to be sufficient to make the torpedo a most formidable weapon—particularly as the inventor has fitted to the torpedo wirelessly-controlled steering planes which enable those on the aircraft from which the torpedo has been released to regulate its rate of descent, also to guide it from side to side in order to direct it accurately to any given target.—*Evening News.*

**The Boy Scout Shilling Fund.**—With a view of assisting the Prince of Wales's appeal on behalf of the Boy Scouts, a Shilling Fund has been opened by the Committee of the Hyde Park Dance Club. On May 24th (Empire Day) the Fund will be inaugurated by an "At Home" and "Thé Dansant" at the Hyde Park Hotel (4 to 6.30).

Particulars will appear from time to time, it being the intention to hold attractions daily from the date of inauguration for a week, the whole culminating in a grand ball to be held at the Hyde Park Hotel on the eve of Derby Day, May 31st.

The arrangements are being made with the assistance of Messrs. Tredegars, Ltd., of 7, Brook Street, W., who have placed the whole of their organisation at the disposal of the Fund Committee, and from whom invitation cards for the "At Home" may be obtained. Books containing 20 shilling vouchers, with receipts, will be issued to those interested.

**Hydrotechnics at Grenoble University.**—In our issue of July 2nd, 1920, we published an article by Major T. Rich, describing the exceptional facilities afforded by the University of Grenoble for the study of water-power and power transmission during the Summer Holidays. A series of Vacation Lectures, with visits to some of the numerous installations in the neighbourhood, was arranged, but, owing to the short notice, only a few students attended. Nevertheless, the satisfaction shown by those who joined demonstrated that the experiment was worth continuing. It is proposed, therefore, to hold a Vacation Course of Lectures on the Utilisation of Water-power, with some notes on Power Transmission, in the summer of 1921, arrangements being made to visit some of the interesting local installations. A preliminary programme of this course has been forwarded to us, from which it is clear that the ground will be thoroughly covered.

The lectures will be given in such a way that those who have had French lessons at a public school can follow the work without difficulty. However, a course of preparatory instruction in French for those who do not know the language sufficiently will be given during the four weeks immediately preceding the beginning of the technical course. The charges for board and lodging will vary in August next between 240 fr. and 600 fr. per month, *i.e.*, between £4 10s. and £11 per month, at the present rate of exchange.

The Hydro-electric Technical Course will in all probability be started towards August 8th or 10th, and will extend over a period of one month. The registration fee for this course will be 110 fr. (£2). The registration fee and charges for the preparatory course in French will be 200 fr. (£3 15s.).

It is proposed to throw the course open to students of the technical colleges and engineering institutions, and also to those members and associate members of the Institutions who are interested in these questions. Grenoble is the holiday centre of the French Alps, with ample opportunities for amusement, and rooms are available to suit all purses. A special electrotechnical course will be held for British students and members of institutions, if a sufficient number of them attend at Grenoble in August next. A decision on that point will be taken at the beginning of June, and in order to arrive at such decision it is particularly requested that all those intending to join should inform the Office National des Universités et Ecoles Françaises, at 45, Great Marlborough Street, W. 1, and should register on or before May 28th. The registration fee will be payable on or before June 15th.

Further particulars are to be obtained from Mr. H. Sloog, hon. sec., British Bureau, Engineering Department of the Office National, at the above address.

**Service Notes.**—Captain A. Reed, Tyne Electrical Engineers, who has just been appointed adjutant of that corps, was its quartermaster until recently; Wireless Telegraphist A. Dean, serving ashore, has been promoted commissioned telegraphist from the 12th ult.; Wireless Telegraphist H. Johnstone, serving with the *Vivid* at Devonport, has been promoted commissioned telegraphist from the same date; and Wireless Telegraphist A. H. Warburton, serving on the flotilla mother-ship *Maidstone*, has been similarly promoted; Warrant Telegraphist A. E. Wither has been appointed to the destroyer *Shakespeare* for wireless telegraphic duty with the Sixth Destroyer Flotilla, from May 1st.

**Electricity Supply.**—In a letter to *The Times* of May 11th, Alderman Beaumont, Chairman of the District Industrial Council (London area) for the electric supply industry, stated that the London electricity works were not affected by the dispute between the National Federated Electrical Association and the Electrical Trades Union. The employers were in negotiation with the unions regarding the reduction of wages in view of the reduced cost of living, and in accordance with their agreement, the matter would, if necessary, be carried before the National Joint Industrial Council, and finally to the Industrial Court.

**Appointments Vacant.**—Two assistant electrical engineers (Rs. 920 and Rs. 690 per calendar month respectively) for the East Indian Railway Co.; chief clerk and accountant (£320) for the Grimsby Corporation electricity department; chief assistant engineer (£250) for the Horsham Urban District Council electricity works; telegraph foreman (£440) for the Government of the Gold Coast. See our advertisement pages to-day.

The Council of the Institution of Civil Engineers is inviting applications for the post of secretary, at £2,000 per annum. The age specified is between 33 and 48, and applications have to be delivered to the President by June 11th.

**Commemoration of Ampère in Paris.**—Representatives of the Union of Engineers' Syndicates, and in particular of the Syndicate of Electrical Engineers, gathered at the tomb of André Marie Ampère in the cemetery of Montmartre, in Paris, on May 8th, to commemorate the hundredth anniversary of Ampère's discovery of those principles of electricity which led to many of its modern uses, and caused his name to be employed as that of the practical unit of electrical current. M. Boucherot, President of the Engineers' and Electrical Syndicates, who during the war perfected the ground telephone, which rendered great service to the French and Allied Armies, spoke at the graveside, showing how from a small beginning the use of electricity had grown till at the present time more than 50,000 skilled workers were employed in various kinds of electrical work, not including telegraphs and telephones. In paying a tribute to Ampère, M. Boucherot pointed out that not only was he a great scientist and a good citizen, but also something of a philosopher. He was much interested in psychology, and left two volumes, unfortunately incomplete, on 'The Classification of Ideas."—*Reuter's Trade Service* (Paris).

**The Electrical Trades Benevolent Institution.**—At the last general meeting of this Association, alterations were made to the rules, giving additional powers to the Local Advisory Committees. The necessary confirmatory meeting will be held at the Cable-Makers' Association's offices, Sardinia House, Sardinia Street, W.C. 2, on Monday, June 27th, at 2.30 p.m.

**Shoe-Fitting by X-rays.**—A novel X-ray apparatus, by which one can actually see whether new boots or shoes fit, has been installed in a Kensington boot-makers' shop. The purchaser of the shoes stands on the platform of the apparatus, and the X-ray view of the foot and boot is displayed to the purchaser and assistant. "The apparatus is perfectly safe for all ordinary circumstances."—*Daily Mail.*

**Lochaber Water Power.**—On Wednesday, last week, a Committee of the House of Commons approved of the preamble of the Lochaber Water-Power Bill, by which the British Aluminium Company is seeking powers to utilise the flood waters of the River Spey for the purpose of generating electrical energy.

**Oil Fuel for the Underground.**—The power stations of the Underground Railways at Lots Road and the Metropolitan Railway at Neasden are now being fitted for the use of oil fuel, and a proposal to use oil fuel at the tramway generating station is being considered. The system adopted for the Lots Road and Neasden power stations gives the advantage of rapid conversion of existing types of coal-burning furnaces. It is known as the Scarab oil-burning system with the patent Scarab burner, and the conversion is carried out without entailing structural alterations. The conversion is being effected gradually, so as not to interfere with the work of the stations. Apart from the advantage that oil fuel is available, while coal supplies are likely to be short for some time, it is claimed that the conversion will result in considerable economies, because:

(1) Consumption is 50 per cent. less than coal.

(2) One man can do work requiring six men in the case of coal fuel.

(3) Storage is simpler and handling easier.

(4) Supplies can be obtained without fear of interruption.—*The Times.*

**The Austin Motor Company.**—In connection with the appointment of a receiver and manager in respect of this company, it is reported in the Birmingham papers that Sir Herbert Austin, M.P., chairman and managing director, addressed a meeting of 2,000 employés of the company in the kinema hall at the Longbridge works during the luncheon interval on April 27th, and detailed the history of the strenuous efforts which had been made during the last year to run the company successfully with a million and a half less capital than the amount which was admittedly required for such an enterprise. The negotiations now in hand would, he felt sure, result in placing the company in a more satisfactory financial position. In the meantime it had been found necessary to protect the interests of all concerned by placing the business temporarily in the hands of a receiver. He urged them to give loyal assistance to the company, and prophesied that the good sense of the English people would very shortly lead to a cessation of the coal strike and other trade disputes, whereupon an extremely bright future might be anticipated for the company.

## INSTITUTION NOTES.

**Institution of Electrical Engineers.**—WESTERN CENTRE DINNER.—The twenty-second general meeting was held at Bristol on Monday, May 2nd, when a good audience assembled under the chairmanship of Mr. A. J. Newman to listen to an address which was delivered by the President of the Institution, Mr. Llewellyn B. Atkinson, who took as his subject "Four Great Electric Lights," namely, Faraday the discoverer, Maxwell the interpreter, Kelvin the measurer, and Silvanus P. Thompson the teacher. The PRESIDENT, who was in his best form, spoke to an appreciative audience for nearly two hours. Following the address a dinner was held at the Grand Hotel to enable members to meet the President. Unfortunately several members who had intended to be present found themselves unable to do so on account of the disorganisation of the railway services, and the South Wales contingent had to depart at an early hour in order to travel by the last train to Cardiff; nevertheless, a thoroughly enjoyable evening was spent.

Mr. A. J. NEWMAN again presided, and others present included Mr. Ll. B. Atkinson, Mr. A. Ellis (immediate past chairman of the Western Centre), Mr. Nicholas Watts (president of the Bristol Society of Engineers), Prof. D. Robertson, D.Sc., Messrs. H. I. Rogers, A. C. McWhirter, W. A. Chamen, W. Collins, S. B. Haslam, W. T. Kerr, G. H. Langdon, T. E. Lewis, A. N. Moore, I. A. D. Pedler, H. T. Sully, H. S. Ellis, T. Hood, A. F. Coates, and Messrs. A. J. Ostler and C. T. Allan (joint hon. secretaries of the Western Centre), the grand total of members and guests being 58. The brevity of the speeches may be attributed to the eagerness to proceed with the capital musical programme, the songs of Miss O'Gorman and Messrs. J. G. Royce, L. Dore, and Huntingdon being greatly appreciated.

After the loyal toast, Mr. NICHOLAS WATTS proposed the toast of "The Institution of Electrical Engineers," referring to its small beginning and subsequent growth, the responsible work it was undertaking, the value of its library, and the importance of the work of its territorial centres and sub-centres throughout the country.

Mr. LL. B. ATKINSON (president of the I.E.E.), in responding, said he was glad to find himself again amongst men of the Western Centre, the acquaintance of many of whom he had made during the Institution's summer visit to South Wales last year. They were looking forward to visiting Scotland next month, but they would never forget the success of last year's meeting. It was very gratifying to note how the president (and the Institution through him) was welcomed wherever he went; he had personally visited all the territorial centres, with the exception of the two Irish ones (he hoped that omission would be excused), and he had everywhere been well received. The membership of the Institution now very nearly approached 10,000 members of all classes—a figure to be proud of, and one which no other institution had been able to approach. Those results had been arrived at largely by the aid of the local centres and the fact that the local chairmen sat on the Council of the Institution.

The president made an appeal on behalf of the Benevolent Fund, recalling Mr. Hugman's offer, and said that they must do all they could to comply with his conditions. If they did not succeed in obtaining individual offers, they might, with the help of the local centres gather the requisite sum collectively, but in any case no effort should be spared to do all they could to help the fund, as there was no doubt that it would be needed in the years to come.

He hoped the Institution would be back in its own building by the middle of this month, when they hoped to introduce certain improved arrangements, such as keeping the library open in the evenings, making the common rooms more comfortable, &c. In the annual report of the Council which would shortly be received by members, only a brief mention would be found of the proposed charter, but they would have opportunity for discussing it at the annual general meeting; the Council would doubtless have the support of the general body of members in its application to the Privy Council. They had included in the draft charter a clause which would give members and associate members the right to call themselves "Chartered Electrical Engineers."

Mr. ARTHUR ELLIS proposed the toast of "The Visitors," and assured them that they of the Western Centre always enjoyed welcoming visitors, because one of their aims was to create interest in the Institution and its work outside of its membership. The toast having been briefly acknowledged by Mr. J. P. Brazil, the president proposed that of "The Chairman," and referred to the success of the Western Centre and its present session.

Mr. A. J. NEWMAN, in briefly replying, disclaimed any credit, remarking that all the members of the Centre were so keen, and he had had the assistance of such able officers, that the session could not have been anything but a successful one.

The meeting then terminated with the singing of the National Anthem.

**Royal Institution.**—A general meeting was held on May 9th, at which Sir J. J. Thomson was elected honorary Professor of Natural Philosophy, and Sir Ernest Rutherford Professor of Natural Philosophy.

The Friday evening discourse on May 27th will be delivered by Mr. A. Mallock on "Elasticity."

**Institution of Civil Engineers.**—ENGINEERING CONFERENCE, 1921.—Arrangements have been made to continue this year the series of conferences which were interrupted by the re-building of the Institution premises and the war. The conference will be held on Wednesday, Thursday, and Friday, June 29th and 30th, and July 1st—the mornings of those days being given to discussions upon selected topics, and the afternoons to visits to engineering works. For the purpose of the meetings, the conference will be divided into seven sections:—(I) Railways, Roads, Bridges, and Tunnels; (II) Harbours, Docks, Rivers, and Canals; (III) Machinery; (IV) Mining and Metallurgical Processes; (V) Shipbuilding; (VI) Waterworks, Sewerage, and Gasworks; (VII) Electricity Works and Power Transmission. The topics to be discussed at the meetings of each section will be notified early next month, and it is intended that prints of the notes introducing the several subjects shall be made available before the date of the conference. The complete programme, including the list of visits to works, will, it is hoped, be also ready for issue early in June, and will contain particulars to enable members to decide upon the visits they may wish to attend.

The twenty-seventh James Forrest Lecture will be delivered by Sir George T. Beilby, F.R.S., Assoc.Inst.C.E., on Tuesday, June 28th.

**Manchester Wireless Society.**—A general meeting was held on April 27th, at which the work of the past session was reviewed and future progress discussed. On April 30th the Society conducted a ramble in the neighbourhood of Hale. Three portable sets were erected at different points, and splendid results obtained in reception from standard stations. A congratulatory message from Paris to the Luton Wireless Society was intercepted. The same evening transmission took place from headquarters, using one valve, and this was received at a point 20 miles distant. Telephony was also tried, with fairly good results, up to seven miles.

**Association of Engineers-in-Charge.**—Owing to the continuance of the coal dispute the Council has found it necessary to postpone the annual dinner, and all subscriptions are being returned.

A visit is to be paid to the Hammersmith Borough Electricity Works on May 21st, and early in June the works of Messrs. Fraser and Chalmers (G.E. Co.), Erith, are to be visited.

**The Royal Society.**—At a meeting on Friday last Prof. Albert Einstein and Prof. Peter Zeeman, amongst others, were elected foreign members.

**Physical Society of London.**—At the meeting held on March 22nd a paper on "A Method of Measuring Frequencies," by Messrs. B. S. Smith and G. F. Partridge, was read by the latter. A heterodyne method of measuring frequency by comparison with a calibrated valve oscillator was described. The calibration was performed by means of two valve oscillators capable of giving frequencies of, say, 1,000 per sec. and upwards. The frequency of the oscillations was raised alternately to give a beat note whose pitch was determined by comparison with a fork. Intermediate frequencies were found by interpolation on the calibration curve, and a method of checking the capacities of the oscillator condensers was described. For the measurement of acoustic frequencies the sounds were converted into alternating currents by means of a suitable transmitter.

**Edinburgh Electrical Society.**—The annual business meeting of the Society was held on May 6th. The treasurer submitted a satisfactory statement of affairs, which showed an increased membership over the preceding session. Prizes were presented to three apprentices, A. Clunie, D. Bee and T. Mercer, for competitive papers which they had submitted. The following were elected for the next session :—Chairman, D. S. Munro; and vice-chairman, J. Stark.

**Association of Teachers in Technical Institutions.**—On Monday next the annual conference will be opened at Cardiff, and it will extend until Wednesday. Amongst the papers to be read are the following :—"A National Scheme of Technical Education," by Mr. C. Coles, B.Sc., and "Apprenticeship in its Relations to Technical Schools and Industries," by Mr. R. James, Wh. Ex. Resolutions will be considered urging the necessity of a Royal Commission on the whole field of technical education, pressing for the speedy bringing into force of the Education Act of 1918, advocating an increase in the number of scholarships available at Day Technical Institutions, and calling for amendments of the Teachers' Superannuation Act of 1918. An attractive programme of social gatherings and visits to places of interest has been arranged.

**Societe des Ingenieurs Civils de France.**—A summer meeting of the British Section will be held in France between June 18th and 24th. It has been decided that, in the same way as in 1920, participation in the tour will not be confined to the members of the British Section, and that members of recognised British Engineering Institutions or engineers in general will be welcome.

A copy of the programme and full particulars of the meeting can be obtained from the Hon. Secretary, 45, Great Marlborough Street, W. 1. The meeting will embrace visits to Verdun, Nancy, Metz, and the ironworks and factories of the Lorraine area. Ladies are cordially invited.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

FOLLOWING upon his election as Speaker of the House of Commons, the RIGHT HON. J. H. WHITLEY, M.P., has resigned the Joint Presidency of the Industrial League and Council which he has held for so long in conjunction with the Right Hon. G. H. Roberts, M.P. Viscount Burnham, C.H., has consented to become Joint President in his stead.

MR. H. E. BLAIN, C.B.E., assistant managing director of the Underground Group of Companies, has been retained by the Transportation Commission of Toronto to advise that city on its transportation problems, and is sailing for New York in the *Adriatic* on May 18th. Mr. Blain will be joined later by MR. C. S. LOUGH and MR. J. L. B. LINDSAY, the comptroller and accountant, and the assistant secretary and treasurer, respectively, of the Underground Group, and the party will then make a tour of many of the important cities of the United States to study transportation methods.

SIR WILLIAM SLINGO, the new British Controller-General of Peruvian Posts, Telegraphs, and Wireless Communications under the concession recently granted to the Marconi Co., of London, arrived at Lima, last week, says *The Times*, and is taking charge immediately.

Maidenhead Town Council has increased the salary of the electrical engineer (MR. MILTON), according to a formula recommended by the A.M.E.E. (approximately £621).

We regret to learn that MR. L. L. ROBINSON, borough electrical engineer, Hackney, has recently undergone an operation. The Council has granted him two months' leave.

MR. H. PAYN has been appointed engineer and manager to the Northwood Electric Light and Power Co., Ltd., in succession to Mr. E. J. Smallpage. During the past few months, Mr. Payn has been in charge of the company's extension scheme.

MR. STAINER HUTCHINS, of Davenham, Cheshire managing director of Electro Bleach and Bye-Products, Ltd., has joined the board of directors of the Lawes' Chemical Manure Co., Ltd.

The Emperor of Japan has conferred the Order of the Rising Sun upon SIR JAMES MCKECHNIE, of Messrs. Vickers, Ltd., Barrow-in-Furness.

**Obituary.**—MR. H. G. MUNRO.—The death is announced of Mr. Hugh George Munro, O.B.E., secretary of the Electric and Ordnance Accessories Co., Ltd., Birmingham, at the age of 41. The funeral took place at Yardley old church on Friday last. The firm was represented by Mr. W. Dallow, and Mr. R. Phillips attended on behalf of Messrs. Vickers, Ltd. (London).

**Will.**—The late MR. BERTRAM BLOUNT, F.I.C., F.C.S., left £4,817.

## NEW COMPANIES REGISTERED.

**Reeve & Bayman, Ltd.** (174,494).—Private company. Registered April 30th. Capital, £10,000 in £1 shares. To take over the business of electrical and mechanical engineers, carried on by W. T. Reeve and W. G. Bayman at Plymouth as "Reeve, Bayman & Co." The permanent directors are: W. T. Reeve, 11, Boons Place, Plymouth; W. G. Bayman, 40, Hill Park Crescent, Plymouth. Qualification: £100. Solicitor: B. H. Chowen, Westwell Chambers, Westwell Street, Plymouth. Registered office: 13, Russell Street, Plymouth.

**Power & Lighting Supplies Co., Ltd.** (174,477).—Private company. Registered April 29th. Capital, £5,000 in £1 shares. To take over the business of electrical and mechanical engineers carried on by H. Challis-Sowerby, G. F. Jones, and R. H. Homer, at 5, Cathedral Yard, Manchester, as the "Power & Lighting Supplies Co." The first directors are: G. Rigby, "Runnymede," Broughton Park, Manchester; H. Challis-Sowerby, "The Nook," Swinton Park, Manchester; J. Price, 102, Banner Cross Road, Sheffield. Qualification: £100. Secretary: G. F. Jones. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster. Registered office: 5, Cathedral Yard, Manchester.

## OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

**Brierleys' Premier Welding Co., Ltd.**—Particulars of £500 debentures authorised April 13th, 1921, whole amount issued, charged on company's property, present and future, including uncalled capital.

**Lincolnshire Motor & Electric Traction Co., Ltd.**—Satisfaction in full on April 1st, 1921, of debenture dated October 19th, 1919, securing all moneys and liabilities due from company to bankers. Particulars of £5,000 debentures, authorised April 1st, 1921; whole amount issued; charged on the company's undertaking and property, present and future, including uncalled capital.

**W. R. Sykes Interlocking Signal Co., Ltd.**—Particulars of £5,000 debentures authorised April 20th, 1921, whole amount issued; charged on the company's undertaking and property, present and future, including uncalled capital.

**New Lowca Engineering Co., Ltd.** (in liquidation).—Satisfaction in full on February 17th, 1921, of first mortgage debentures dated April 3rd, 1908, securing £12,500.

**Campbell & Isherwood, Ltd.**—Mortgage on certain land in Bootle, Lancs., dated April 28th, 1921, to secure all moneys due or to become due from company to Bank of Liverpool and Martins, Ltd.

**Aladdin Renew Electric Lamp Corporation, Ltd.**—Issue on April 28th, 1921, of £1,500 debentures, part of a series already registered.

**W. T. Glover & Co., Ltd.** (56,124).—Return dated April 4th, 1921. Capital, £214,850 in £1 shares (100,000 preference and 114,850 ordinary). All shares taken up. £117,000 paid. £97,850 considered as paid. Mortgages and charges: Nil.

**Wycombe Borough Electric Light & Power Co., Ltd.** (53,133).—Capital, £50,000 in £5 shares. Return dated April 19th, 1921. All shares taken up and paid for in full. Mortgages and charges: £50,000.

**Electric Zinc Co., Ltd.** (127,838).—Return dated December 31st, 1920. Capital, £2,000,000 in £1 shares (400,000 preference and 1,600,000 ordinary). Seven ordinary shares taken up. Nothing paid. Mortgages and charges: Nil.

**W. S. Laycock, Ltd.** (68,203).—Return dated January 6th, 1921. Capital, £150,000 in £1 shares (100,000 ordinary and 50,000 preference). All shares taken up. £50,007 paid. £99,993 considered as paid. Mortgages and charges: £221,000.

## CITY NOTES.

**Brush Electrical Engineering Co., Ltd.**

Mr. E. Garcke presided at the annual meeting held on Monday at 88, Kingsway, W.C. He said the accounts again reflected the prosperous condition of the company. The amount carried forward was subject to E.P.D., not only for 1920 but also for previous years, no settlement of the amount payable having yet been arrived at. The question of what was the liability of the company in that respect was a difficult one, and might take some time yet to adjust. The amount carried forward was considerably in excess of their liability. It was a great relief that the E.P.D. had been abolished. They would not be liable for any such duty in respect of the profits made since January 1st this year. The gross profit on trading was £285,328, compared with £223,000 in 1919. The expenses, of course, were higher; general charges were £30,391, compared with £25,000. Maintenance of buildings and plant had cost £40,500, compared with £36,500. Interest charges amounted to £24,500, compared

with £16,500; and for depreciation they had written off £13,000 as against £10,000. At the end of 1919 they carried forward £85,568, and that was reduced by £10,841 in respect of additional remuneration to the directors. The issued capital showed a large increase as a result of the issues made last year. They had had to provide for the largely increased volume of business, necessitating extensions of buildings and plant and a larger lock-up in stock of materials and of work in progress. The magnitude of the increased business could be best seen by the figures representing the item of stock. In 1918 it amounted to £145,000; in 1919 to £314,000; and now it was close on £600,000. The amounts owing to them had also increased. At the end of 1919 they had owing to them £90,000, and at the end of 1920 the outstanding amount was £226,000. One of the great difficulties of a rapidly extending business was to provide for the extension of the buildings and plant and working capital. In normal times these difficulties would not be onerous, but in the present state of the money market and of trade generally, these matters required very careful handling. However, they had not done badly. In July last year they issued an offer of 339,000 £1 ordinary shares at par. The issue was not underwritten; nevertheless, it cost them £15,500 for printing and various other expenses which were high but unavoidable. 248,075 shares were allotted in response to applications received, and, having regard to the not too propitious state of the money market at the time, he thought he might say that the issue was very well received by the public. One of the objects they had in mind in making the issue was to provide houses for some of their workpeople, owing to the general shortage of accommodation in the town; but as they did not get all the capital required, they had left that scheme temporarily in abeyance, and had had the less hesitation in doing so because since then conditions had changed to some extent. The town authorities had made progress with their own housing scheme, and there had been some lack of employment in other industries, which made the shortage of houses less pronounced. It was probable, however, that a little later they might have to revive the scheme, but at the moment capital expenditure for other purposes was more important. He thought they might regard the present position with satisfaction, and might look forward to the future with confidence. The specialities they controlled placed them in a favourable position, notwithstanding the prevailing depression in most branches of industry. Their order books were well filled, and there had been a gratifying increase in the demand for their Brush-Ljungstrom turbo-generator plant for electric power production. They began manufacturing the Ljungstrom turbine in 1914. The orders in hand to-day represented in horse-power more than the total they supplied in the whole of the period from the commencement of manufacture to the end of 1920. That gave some idea of the growth of the business. They hoped that the large new factory now under construction at Falcon Works, Loughborough, to be devoted to the manufacture of turbo plant, would enable them to cope better with the demand. He referred at the last meeting, to their difficulties in carrying through large contracts—which necessarily took months to execute—due to the fluctuating markets for materials, and the uncertainty of labour costs which compelled them to stipulate for price adjustment clauses. In that respect the position had improved, as they were now able to take the risk of making contracts at firm prices, which was a more satisfactory basis both for their customers and themselves. In 1920 the after-effects of the moulders' strike were severely felt; and in a lesser degree the coal strike of last autumn, and a dispute with the Electrical Trades Union were adverse factors. Those recurring labour troubles made it difficult and often impossible to keep faith with customers in the matter of delivery to contract dates, and were cumulative in the prejudice they created, as the uncertainty attending completion naturally militated against orders being placed. The export trade position was far from satisfactory, and the nation was already suffering heavily by loss of much of its foreign business. The first need to-day was to bring about reductions in the prices of commodities. Failing such reductions, that trade, which was so vital to the prosperity of the nation, could not be held in face of competition from countries where wages had not advanced in the same proportion, where the restriction of output was recognised as an error, and where the exchanges were so much in favour of the foreign buyer. Those conditions were a serious handicap to all engaged in the manufacturing industries of this country, and could only be met by bringing prices more into line with those offered by their competitors abroad. If that could be accomplished by means of increased production per head, rather than by the alternatives of lower wages or longer working hours, so much the better. One thing was certain, viz., that their foreign trade would gradually be lost unless some amelioration of the prevailing conditions was possible, while the home trade would also languish under the burden of high prices. In that connection, and apropos of the controversy in the coal mining industry of which they were now the victims, he would like to point out how largely the cost of coal entered into the price of all manufactured goods. That was especially true of the engineering industries, so dependent on steel and iron, which could not be produced at a reasonable cost without cheap coal. That was the real crux of the matter. Out of all the torrent of talk about nationalisation of the mines, national pools, national wages boards, &c., the cold economic fact emerged that, in order to export their coal and the manufactures of which it was the basis, it must be raised at a cost enabling it to be profitably sold in competition with foreign coal of equal quality—otherwise no solution of the present dispute could be permanent. But while fundamental economic facts were ignored on one side, they were relied on too exclusively by the other side. On the general question of labour disputes, he felt that every section of the community and every individual member of it—the Government, the employers, the employed and the consumers—should concentrate on the search for a permanent wage principle which recognised not only the economic rights of the capitalist, of the labourer, and of the consumer, but also the human or moral factors involved in the problem, as a substitute for the system of settling wages by the attrition of supply and demand of labour. The common phrase one heard was that "We must have it out." Quite so. But, as Mr. Clynes had said, "It is better to think it out than to fight it out." So long, however, as the employers were under the delusion that economic laws were the only laws of nature entering into the situation, and so long as the employed made the mistake of ignoring the rights and interests of the community as a whole, so long would the relations between capital and labour be adjusted by physical means. The report was adopted.

**Calcutta Electric Supply Corporation, Ltd.**

During the year 1920 the units sold were 38,820,839, against 31,881,770 in 1919. The houses connected increased by 1,218 to 11,505. The gross revenue was £398,382, against £359,949 in 1919, and the net revenue was £263,482, against £237,206 in 1919. The profit for the year, including interest on money on deposit, was £270,160, and £45,699 was brought forward, making £315,859. This is to be dealt with as follows: Debenture interest accrued £4,579; preference dividend £24,750; income tax and E.P.D. £32,749; interest on consumers' deposits £1,385; writing off total costs of debenture issue in 1920 £24,798; reserve for taxation £83,000; to reserve fund £5,000; depreciation and renewals fund £43,760; insurance fund £3,000; retiring gratuity fund £2,000; dividend on ordinary shares 10 per cent. for the year and a bonus of 1 per cent. (£48,457); carried forward £42,386. The ordinary shareholders obtain, in the interim and proposed dividends, the relief granted in respect of income tax and super tax paid in India, which for the year 1920 is equivalent to about an additional 1 per cent.; and with effect from July 1st, 1920, preference shareholders have received their dividends free of all taxation on income, both British and Indian, up to 6s. in the £. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the net Indian profits, in respect of service during 1920. The expenditure on capital account during 1920 amounted to £338,937, the total outlay to December 31st last being £1,764,844. The demand for electrical energy continues to increase, and satisfactory progress has been made in meeting it. An issue was made in July, 1920, of £500,000 of 5 per cent. first mortgage convertible (registered) debentures, free of income tax. The issue was fully subscribed.

**Johnson and Phillips, Ltd.**

Mr. W. Claud Johnson presided at the annual meeting on May 5th. He said that the profit for 1920 was again nearly £10,000 more than in 1919. Referring to the balance sheet, he said that they had expended during the year £63,408 on additions to buildings and plant. The amount for sundry debtors, £342,560, showed an increase of about £130,000, which was the natural consequence of a very largely increased business, and the same remark applied to the stock in trade and work in progress figure, which now stood at £563,356, an increase of nearly another £100,000. The profits earned during the year were very satisfactory, and the same dividend was to be paid on the increased capital as was paid last year on a much lower figure, although the new capital was not received until well towards the middle of the year, so that they had only had the benefit of it for just over six months. The profits must also be considered satisfactory from the point of view that the year under review was one of exceptional difficulty from the manufacturing standpoint. At the same time it was very pleasing to be able to report that their order books at the end of the year were as full as it was considered safe for them to be, some of the departments having from eight to ten months' work in hand, which included large and important Government contracts, so that the prospects for the current year might be considered highly satisfactory. Orders were still coming in, in spite of the troubled times they were passing through, which fact, he thought, warranted their looking forward with the fullest confidence to the future, as it seemed a clear indication of an early trade revival in which the electrical trade was bound to take the lead. The depression in trade, which set in during the closing months of 1920, and unfortunately still continued, had been felt by the electrical industry to a much smaller extent than by other branches of industry. That was largely due to the increasing recognition of the fact that in the extended application of electric power lay the chief hope of reducing production costs in every direction. Further, the fact that for a long time past the demand for their manufactures had exceeded the supply prevented their suffering losses due to depreciation in the value of stocks. Proceeding to refer to the resolution to be proposed at the extraordinary meeting to increase the borrowing powers of the company, he said that since its

formation in 1905 £277,477 had been spent on additions to plant, machinery, and buildings, and during the same period £146,130 had been spent on repairs and maintenance of the property, and £119,500 written off for depreciation out of profits. Those outlays had been necessary to keep the works and plant up to date, and were justified by the results obtained. To maintain that position it had recently been necessary to obtain financial assistance from their bankers. They now wished to put their finances on a more solid basis by the creation of £350,000 of new debentures which would enable them to redeem the balance of the first debentures and pay off the £50,000 second debentures, also to repay their bankers' advances and provide further working capital to enable them to tackle the ever-increasing volume of business which was offered to them, and for which they were now fully equipped. They proposed to create £350,000 8 per cent. first mortgage debenture stock in multiples of £1 each redeemable in 25 years by a sinking fund to be created and applied in redeeming such debentures by 23 equal annual drawings commencing in 1923. They might have made a preference share issue, but having regard to the high rate of interest which was being paid by other industries for such issues they would have had to pay 10 per cent. interest at least, and that would have been a permanent drag on the business, whereas they would have an opportunity of paying off the debentures as they did in the case of the old debentures, only the remnants of which remained to be paid off, and so secure to the shareholders the full benefits of profits made. There was a further very interesting fact he would like to mention, which in these troublesome times was important, and that was, their relations with their workpeople were most satisfactory. They were one of the first businesses in the country to start a works committee, and it had always had the most beneficial results.

Mr. John Macgregor seconded the adoption of the report.

Replying to questions, Mr. Macgregor said that practically the whole of the £563,000, at which the stock stood, represented material which would be used in orders which were already in hand, and which had been taken at a profit.

Answering questions with regard to the proposed new debenture issue, the solicitor explained that the reason some of the money would be applied in paying off the existing 5 per cent. debentures was that it was not possible in these days to raise a substantial capital issue as a third charge. The question of underwriting the issue had not yet been settled, but the shareholders would have the first right of apply for the debentures.

The report was then carried.

Subsequently the meeting passed the necessary resolution for altering the articles of association and giving the directors power to make the new issue.

**The Ever-Ready Co. (Great Britain), Ltd.**

The report for the year ended March, 1921, states that the amount available for appropriation, after writing off depreciation, is £21,101. The directors recommend, in addition to the interim dividends at the rate of 7 per cent. per annum on the preference and ordinary shares for the period ended September, 1920, final dividends at the rate of 7 per cent. for the half year ended March, 1921, on 102,007 preference shares, fully paid, and on 31,636 preference shares (12s. 6d. paid), plus interest at 7 per cent. per annum on payments in advance. During the year the company acquired the lease for 86 years of one of its factories situated at Carysfort Road, Stoke Newington, at a cost of £5,500 as shown in the accounts. The saving in rental is £480 per annum, and the company's surveyor reported that the erection cost at the time of purchase would have amounted to £13,000 apart from the leasehold value of the ground. In May, 1920, the company offered for subscription to the shareholders 40,000 7 per cent. cumulative participating preference shares at par and 31,636 were applied for and allotted. During the year the company completed the purchase of the additional manufacturing undertaking referred to in the circular letter of May, 1920. Meeting: June 1st at the Works, at Holloway.

**The British Thomson-Houston Co., Ltd.**

The report for 1920 states that the greater part of the extensions to the Rugby works, begun during 1919, was still uncompleted, owing to the various causes which had retarded building operations generally throughout the country. New buildings which had come into occupation at the Willesden works had materially increased their manufacturing facilities there. The changes which were necessary to make the Birmingham works suitable for their purposes were being carried into effect as rapidly as possible. The profits for the year, after deducting all expenses and charges other than interest on debentures and loans, and after making provision for all estimated taxation for the year, were £470,470, plus £208,431 brought forward, making £678,901. From this there is deducted interest on debentures and loans, £179,990. There is to be appropriated for depreciations, reserves, &c., £210,000. The directors recommend that dividends be paid as below, leaving to carry forward £225,892. The dividends recommended are on the old and new shares for the respective times that they were outstanding during the year, and are as follows:—£400,000 old preference shares (since converted into ordinary shares) for eight months at 4 per cent., £10,667; £1,500,000 new preference shares for one month at 7 per cent. (free of income tax), £8,750; £400,000 ordinary shares for 12 months at 6 per cent. (free of income tax), £24,000; £773,500 ordinary shares for four months at 6 per cent. (free of income tax), £15,470; £826,500 ordinary shares for one month at 6 per cent. (free of income tax), £4,132; total, £63,019. In the last annual report the directors recommended that dividends aggregating £250,000 should be declared payable out of the capital reserve account. This was carried out by distributing £250,000 of £1 ordinary shares, of which £210,000 represented accumulated dividends on the old preference shares, and £40,000 dividends on the old ordinary shares. It was also duly approved that the share capital of the company be increased to £4,000,000; £2,000,000 in £1 ordinary shares, and £2,000,000 in £1 preference shares. Of the 2,000,000 ordinary shares, 400,000 replaced the 40,000 ordinary shares then outstanding of the par value of £10 each; 400,000 replaced the 40,000 preference shares outstanding of the par value of £10 each; while 250,000 were distributed in respect of capital reserve account, as stated above, so that when these transactions were completed, ordinary shares to the extent of £1,050,000 had been issued, and there were no preference shares outstanding. During the year there were issued at par the balance of the ordinary shares, amounting to £950,000, thereby completing the total issue of £2,000,000 ordinary share capital. There were also issued during the year, at par, £1,500,000 preference shares, leaving £500,000 to be issued hereafter. The directors have followed their usual practice of making reserves to cover risks in connection with bad debts and other contingencies. The directors record their high appreciation of the manner in which all departments of the company have discharged their duties during the year. Pressure of work has been very heavy, notwithstanding the fact that towards the end of the year the volume of orders began to show signs of decreasing. Annual meeting: London, May 18th.

**The Charleroi Electrical Works.**

The report for 1920 of the Ateliers de Constructions Electriques de Charleroi states that, thanks to their entirely modern equipment, the works at Charleroi and Ruysbroeck were now able to deal with the whole domain of electrical manufacturing. The works constructed the most varied types of machines from the motor of ¼ h.p. to the most powerful alternator, together with all the necessary high and low-pressure apparatus. During the year the company embarked on the production of large motors of from 15,000 to 20,000 h.p. for the direct driving of rolling mill trains, which had formerly to be obtained by the iron and steel industry from other countries, and on the other hand, development took place in the construction of winding engines for collieries, and of sets of motor-driven centrifugal pumps for mine drainage. The bulk production of small motors was organised at the new works of Ruysbroeck, where was also installed the department for railway and mine signalling apparatus, which was capable of constructing apparatus for the electrical operation of signals and points for the most important railways. Concerning the cable factory the report mentions that to the manufacture of armoured cables for all pressures and of telephone cables, there was added the production of signalling cables with multiple conductors, while the productive capacity in rubber-covered wires and cables was notably increased. The orders booked in 1920 exceeded 120,000,000 fr., and this permitted of the new year being begun with a well-stocked order book, which it was hoped would enable the company without too many difficulties to overcome the serious crisis through which the industry was passing at present. Including the balance of 209,000 fr. brought forward, the accounts show net profits of 10,296,000 fr., permitting of the payment of a dividend at the rate of 5 per cent. on the paid-up share capital from January 1st, 1914, to December 31st, 1920. The number of workpeople employed increased from 2,344 in December, 1919, to 3,600 in the same month of last year, and the directors add that a pension fund has been established for the employés, the company paying in an amount equal to that paid by the workers.

**Madras Electric Tramways (1904), Ltd.**

Mr. A. M. Quill presided at the annual meeting on May 4th. He said that a strike had prevailed from January 26th to February 4th, and increased wages and allowances had been granted. One of the conditions of the settlement was that the employés would, under no circumstances, in the future, cease work without referring their grievance to the Labour Commissioner or other authority whom Government might appoint, should the management and the Tramway Union fail to reach a settlement themselves. They considered this arrangement of great value, but on the eve of the Duke of Connaught's visit to Madras, on January 10th last, a complete stoppage of work again occurred without even a complaint being formulated. As similar measures were subsequently adopted in other parts of India, it was obvious that the stoppage was inspired by political motives. The management in Madras, having inquired the nature of the men's grievance, was informed that the union demanded the reinstatement of two men who had been discharged several months earlier. The records of these men, however, showed that, if anything, they had been treated with too much indulgence. The appointment was also demanded of an official (in whose selection the union was to have some voice) through whom dismissals should only be made. It was, of course, impossible to share with the union any question of discipline, and in reply to a proposal to refer the question to arbitration, the board indicated that while they were willing to refer

questions of wages, conditions of labour, or of principle to arbitration, they could not refer any question of management or discipline. Accordingly the strike went on until February 26th, when the men returned to work unconditionally. The effect of the stoppage would, of course, be reflected in the accounts for 1921. In addition to the strike early in 1920 a partial stoppage of the employés of the Madras Electric Supply Corporation, Ltd., which serves the tramways, occurred between May 26th and June 22nd, during which period they had a restricted service of cars running. Notwithstanding these labour difficulties, the traffic receipts for 1920 showed an increase of 16.6 per cent. on 1919. The balance from running account, after providing for cost of maintenance and all expenses in Madras, was £40,893, compared with £26,986 for 1919. The increase was almost entirely accounted for by the difference in exchange. In fact, the entire increase of 16.6 per cent. in traffic receipts was absorbed in increased cost of running, an experience which was probably common to all tramway undertakings. In the latter part of last year the Madras Government authorised them to make increases in fares up to 50 per cent. It was decided to exercise these powers partially, and on March 14th last the three principal stages of As. ½, 1, and 1½ were increased to As. ¾, 1½, and 1½ respectively. There had not been time to obtain reliable data regarding the effect of the increase. After reviewing the assets, the chairman said that the additions to the balance sheet amounted to £30,840, representing, chiefly, the Mount Road extension. They had practically completed their work, but until further progress had been made with the strengthening and widening of the bridges by Government, the line could not be opened for traffic.

**Indian Electric Supply and Traction Co., Ltd.**

Mr. J. G. B. Stone, presiding at the annual meeting, on May 4th, said that they had again increased the number of units sold in all departments, except under the heading of special contracts, where, owing to the temporary stoppage of the mills due to labour unrest, they had a figure of 793,240 units, against 1,110,000 units in the previous year. The total number of units for 1920 in all departments was 4,334,724, against 4,067,923. In spite of labour unrest and delay in getting the necessary renewals for machinery and plant delivered in Cawnpore, they had secured the best results so far obtained by the company. The results of their small tramway were slightly more satisfactory. Good progress had been made with the new power house in course of erection, and the new 6,000-kW plant was now in course of shipment. They hoped to have effective use of the station early in the new year. There was already a demand for the whole output. The profits in Cawnpore showed an increase of Rs. 95,209. The earnings of the company were £35,188, against £27,932 in 1919. Of the increase £1,537 was due to the higher rate of exchange. The average rate of exchange for the year on remittances sent home was just over 1s. 10d.

**London and Suburban Traction Co., Ltd.**

Lord Ashfield presided at the annual meeting on the 5th inst., at Westminster. He said that they had not had a successful year. Tramways throughout the country reached an unremunerative condition some months ago, not through neglect or incapacity in management, but due to the fact that while all payments had moved upwards with the rise in economic levels receipts had by the maximum powers legislation been held almost at the old level. The increases in fares authorised last year caused a steady advance in earnings. The traffic receipts of 1918 were £1,054,000; of 1919, £1,370,000; and 1920, £1,566,000, representing a growth in two years of 48 per cent. In the same period expenses only increased 46 per cent., so that there was a slight gain in net receipts. Now that expenses were once more falling, the tendency shown in these figures would become much more marked, and the results much more satisfactory; as indeed the results for the first three months of this year indicated. While he would not like to commit himself to the statement that the tramways were now out of trouble, he confidently looked forward to some appreciable advancement in their fortunes, and he was confirmed in this expectation by the results which had come before him month by month since January of this year. The first three months of this year showed a substantial gain on the results for the three corresponding months of 1920.

**Babcock & Wilcox, Ltd.**

The net profit for the year 1920 was £497,468, plus £123,225 brought forward, less £2,100 directors' bonus voted last May. The preference dividend of 6 per cent., less tax, the second preference dividend of 5 per cent., less tax, and 16 per cent. free of tax on the ordinary shares being provided for, £150,000 is to be put to reserve and £10,000 to the Staff Pension Fund, leaving £99,828 to carry forward. The extensions at the works to provide for greater output and to make good the reduction in output occasioned by the alteration in working time to 47 hours per week are now completed. This has entailed a large outlay. The output of the workmen is still on the average below pre-war standard, and the continual interruptions, through trade disputes, militate against the business. The coal strike has caused a stoppage of the works in certain departments. New offices at London and Renfrew have been completed and occupied, and more workmen's dwellings have been completed during the year. New orders are just now somewhat difficult to obtain, owing to the high cost and the financial conditions that prevail. The construction of the large works of the Sociedad Espanola de Construcciones Babcock & Wilcox in Spain is now completed, and these works are in operation and well supplied with orders.

**Pernambuco Tramways & Power Co.**

Mr. Follet Holt presided over an extraordinary general meeting on the 6th inst., at which a resolution was passed increasing the borrowing powers of the company by £650,000. The war held up their operations, and it was necessary to revise their position. More capital was required, and the fares must be increased to meet the additional labour costs and the fall in the milreis. In order to carry into effect the improved conditions of their concession they must complete the tramways to obtain improved fares. They had also to meet the indebtedness to their bankers and for essential materials supplied, which had accrued during the bad period through which they had passed, and also provide the funds for completing the lighting and power supply of the city, which was a most lucrative branch of their business. The electrification and equipment of the old steam tramline could not be delayed. In its present condition it was very expensive to operate and maintain, and electrification would bring immediate benefit. They had laboured under this burden of inadequate fares for the last six years, but now saw daylight, and believed that with the completion of the works their revenue from all sources would place the future of the company on a progressive and satisfactory footing. In spite of adverse circumstances the tramway and electric light and power system had shown satisfactory expansion. In 1915 they carried 15,000,000 passengers and last year over 32,000,000. In the same years the number of consumers of light and power had increased from 100, who consumed 175,000 units, to 3,000 consumers, who purchased 2¼ million units. With normal exchange and normal values for fuel and material this expansion would have led them to a very satisfactory revenue. There was ample room for more development. The public wanted more cars and more light, and what the company wanted was higher fares, and these they would obtain when they had carried out their share of the bargain.

**Dutch Wire & Cable Works.**

The directors of the N.V. Hollandsche Draad en Kabelfabriek, of Amsterdam, reporting on the past year, state that, owing to the developing depression, the results obtained in 1920 did not reach expectations. It was proposed to pay a dividend at the rate of 8 per cent. on the ordinary shares, as compared with 68 per cent. in 1919 (18 per cent. in cash and 50 per cent. in gratis shares). In forming an opinion of the amount of the dividend it was necessary to bear in mind in addition to the larger nominal capital, that the valuation of the stocks had been taken on the basis of pre-war prices, except in the case of rubber which, in consequence of the further fall in prices, had been entered at the lowest quotation in December. Through the return of former competitive conditions it was necessary, as before the war, to hold large stocks of manufactures in order to be able promptly to effect deliveries, both in Holland and abroad, and considerable amounts had, therefore, been written off the cost prices of these stocks by the operation of this method of valuation. As to the present and future development of the company, the directors point out that the depression prevailing in all markets, both in Holland and abroad, rendered it difficult to conclude new business, and in this connection it is submitted that leading foreign competitors had the advantage of easier labour regulations and lower exchange, and the cheaper labour costs associated with it, thus causing sale prices to be greatly depressed. On the other hand, the raw materials, which formed a considerable part of the value of the manufactures, were derived from countries having a sound currency, so that competition on unequal conditions remained limited to the costs of labour and general expenses. The net profits amounted to 284,000 fr., as compared with 2,090,000 fr. in 1919.

**Swedish Companies.**

The shareholders in the *A.B. Induktor* have adopted a resolution to reconstruct the company.

The accounts of the *A.B. Elektrostalverk* show a small loss for 1920, which has been carried forward.

The report of the *Elektriska A.B. Volta*, which was reconstructed last year, states that the expectations of the passing away of the crisis which started after the conclusion of peace, of which indications manifested themselves in the later months of 1919, were completely disappointed during 1920. The year opened with a strike extending over two months, and this was not followed, as was expected, by an upward movement, but by a depression in the second half which practically paralysed all industries. The value of the turnover amounted to 1,900,000 kr., as compared with 2,490,000 kr. in 1919, and the stock of orders at the close of the year represented 305,000 kr. Owing to the heavy fall in prices in all departments, considerable amounts were written off for depreciation of stocks and of machines (1,577,000 kr.), and the directors report a loss of 2,295,000 kr. for the year on share capital of 6,500,000 kr.

The directors of *Nya Luth & Rosens Elektriska A.B.*, of Stockholm, which is the successor of the old company which was liquidated in the spring of 1920, have issued their report

for last year. Although the undertaking was taken over by the new company as from the beginning of 1920, the new management first started its activity in June. The report states that the economic situation was found at that time to have become worse for the company, partly on account of the strike at the workshops for two months in the first quarter of the year, and partly because orders had to be accepted in the second half of 1919 to a great extent at prices below the costs of production with the object of ensuring continuity of working in the shops. These orders had to be executed in 1920 when the cost of labour and materials was considerably higher. Under these circumstances it was a commanding necessity for the new management to undertake a thorough reconstruction and curtailment of the administration which had swollen out to an excessive extent during the favourable situation of trade, and also to adopt measures for reducing the general expenses. In connection with this the company's branches and subsidiaries were reorganised, of which the report gives particulars. At the same time special attention was devoted to increasing the productive capacity of the shops in Stockholm and of the foundry at Eskilstuna. All these measures rendered it possible to equalise the losses incurred in the first half of the year, which closed with net profits of 19,066 kr., which sum has been carried forward to 1921.

---

**Rangoon Electric Tramway & Supply Co., Ltd.**—As from April 1st, 1920, the control of this company was transferred to Rangoon. The accounts for 1920 show a gross profit, including transfer fees, &c., of £99,663, and after providing for debenture charges, allowing £3,115 for depreciation of sundry assets in Rangoon, transferring £27,500 to reserve for renewals, paying £4,150 Indian income tax, and deducting other charges, the net profit is £37,642. The directors recommend a dividend on the ordinary shares of Rs. 1-8 per share for the year (free of all income tax to shareholders domiciled in India or Burma), leaving £9,302 to be carried forward, against £4,360 brought in. Owing to fluctuation in the rate of Indian exchange, the board took counsel's opinion regarding the payment of dividends, and were advised that these payments could only be paid legally at the current rate of exchange. Since then dividends have been so calculated. It is on this account that the present dividend recommended on the ordinary shares will be declared in rupee currency. Warrants for the dividend on the ordinary shares will be posted in Rangoon on May 31st.—*Daily Telegraph.*

**Jarrow & District Electric Traction Co., Ltd.**—Total revenue for 1920 £16,532, an increase of £505. After deducting expenses, and adding £4,620 brought forward, the balance is £7,215. A dividend of 5 per cent. is to be paid on the ordinary shares, and £4,219 carried forward. The price of electricity supplied to that portion of the company's undertaking within the borough of South Shields was increased to 1.75d. per unit as from April 1st, 1920. The South Shields Corporation having refused to entertain the company's proposal for mutual through-running of cars on the tramways of the Corporation and the company, the Minister of Transport has been requested to exercise his powers under Section 5 of the Ministry of Transport Act, 1919, to order through-running, and, in default of agreement between the Corporation and the company, to settle the terms of such through-running.

**Stock Exchange Notices.**—The Committee has ordered the undermentioned to be officially quoted:—

Newcastle-upon-Tyne Electric Supply Co.—£500,000 4½ per cent. consolidated first mortgage debenture stock (redeemable).

Newcastle-upon-Tyne Electric Supply Co., Ltd.—134,834 5 per cent. preference shares (non-cumulative) of £1 each, fully paid, Nos. 1,359,502 to 1,442,951 and 1,443,952 to 1,495,335.

London Electric Supply Corporation, Ltd.—£100,000 4 per cent. first mortgage debenture stock (redeemable).

Yorkshire Electric Power Co.—80,306 ordinary shares of £10 each, fully paid, Nos. 1 to 45,380, 45,501 to 53,203, 53,302 to 53,343, 53,499 to 54,398, 55,396 to 65,353, and 66,254 to 82,576; and £230,000 5½ per cent. redeemable debenture stock.

Application has been made to the Committee to allow the following to be officially quoted:—

English Electric Co.—£1,250,000 8 per cent. six-year secured notes.

**Gateshead & District Tramways Co.**—Total revenue for 1920 £125,238. After deducting expenses, including £3,000 for renewals, and adding £3,659 brought forward, the balance is £35,525, out of which £10,215 is put to reserves, and £3,034 to mortgage sinking fund. The preference dividends of 6 per cent. and 5 per cent. are paid, and 10 per cent. is recommended on the ordinary shares, carrying forward £2,018. Capital expended during the year, £22,721.

**Adelaide Electric Supply Co., Ltd.**—Interim dividend on the ordinary shares for the half-year at the rate of 12 per cent. per annum., free of British tax.

**Switzerland.**—The Société pour l'Industrie de la Schappe, of Basle, is declaring a dividend of only 8 per cent. for last year, as compared with 20 per cent. in 1919.

**New Steel Works in India.**—At the annual meeting of Messrs. Fairbairn, Lawson, Combe, Barbour, Ltd., last week, the chairman referred to the works that through a specially formed company they were putting down in India. Considerable progress had been made with these Indian works, though, for reasons beyond their control, and principally delay in the delivery and fabrication of the necessary constructional steel work, progress had not been quite so rapid as they would have desired. The cost, however, would exceed what they, relying necessarily on expert advice from, and estimates prepared by consulting engineers acquainted with Indian conditions, had anticipated. In addition to increases on these estimates, they had to reckon with the fall in the rupee. They were assured that these works, when completed, would be the finest in India, and they believed that they would have a great future. They would be under the expert management of Major Alan Combe, who was brought up at their Belfast establishment.

**Bath Electric Tramways, Ltd.**—Mr. J. B. Hamilton presided at the annual meeting on May 5th. He said it was inevitable if business was to continue that costs would have to be reduced, and as the cost of living came down wages must also do so. They received permission last July to increase fares, and the result was an advance of £7,200, but this was not sufficient to off-set the extra cost of wages and materials. Fuel alone during the year cost over 24 per cent. more than in the previous year, though the tonnage consumed was less. A short time ago they adapted their furnaces at the power station so as to burn a lower grade fuel. The accounts this year did not include the motor business and foundry, these having been transferred to a separate company. It was exceedingly difficult to make any forecast as to the future.

**Craigpark Electric Cable Co., Ltd.**—During the year ended March 31st, there was a net profit of £15,677 after providing for E.P.D. and corporation tax, plus £2,926 brought forward, making £18,603. Out of this £2,000 is put to depreciation of buildings and machinery, £6,000 to reserve; 6 per cent. is paid on the preference shares for the year, requiring £2,850; a dividend of 12½ per cent. is to be paid on the ordinary shares, absorbing £4,687; leaving £3,066 to carry forward, subject to payment of directors' fees. The death is recorded of Mr. Donald MacLean, who was recently appointed a managing director, after serving with the company since its inception. Meeting held at Glasgow yesterday.

**Northern General Transport Co., Ltd.**—The company possesses a fleet of 102 motor vehicles, and the gross traffic receipts again show an increase, chiefly due to the larger number of vehicles in service. The investments in the Gateshead, Tynemouth, and Jarrow electric traction companies stand in the books at cost (£405,812). Dividends for the year 6 per cent. on the preference and 10 per cent. on the ordinary shares; carried forward, £17,853.

**Siemens Bros. & Co., Ltd.**—A final dividend is recommended of 1s. per share, making 10 per cent. for 1920, free of tax. The directors propose to increase the authorised capital by the creation of 1,000,000 10 per cent. £1 cumulative preference shares and to issue 300,000 of the same to all the existing shareholders by way of bonus, in the proportion of one fully-paid preference share for every five shares held.

**Tynemouth & District Electric Traction Co., Ltd.**—After paying 5 per cent. on the cumulative preference shares for the year and 10 per cent. on the ordinary, £8,794 is to be carried forward.

**Submarine Cables Trust.**—Net revenue for the year ended April 15th £35,052, plus £67 brought forward. After providing £9,195 to meet payment of the coupons, £25,905 has been transferred to redemption fund, leaving £19 to carry forward.

**Melbourne Electric Supply Co., Ltd.**—Interim dividend on the consolidated ordinary stock for the half-year at the rate of 10 per cent. per annum, free of British tax.

**Western Union Telegraph Co.**—Dividend of 1¾ per cent., less tax, on the common stock for the quarter.

**Cleveland & Durham Electric Power Co.**—After putting £5,000 to reserve and paying £32,665 to debenture interest, &c., £5,360 is to be carried forward.

**Swansea Improvements & Tramways Co.**—Dividend on 984 preference shares at the rate of 6 per cent. for 1920, and on 4,016 preference shares at the rate of 5 per cent., carrying forward £2,099.

**Newcastle-upon-Tyne Electric Supply Co.**—Messrs. Lazard Bros. & Co., Ltd., have purchased £250,000 4½ per cent. first mortgage debenture stock in this company at 70 per cent., and they are offering it for sale at 71¼ per cent., less a brokerage of ¼ per cent.

**Anglo-Argentine Tramways Co., Ltd.**—The directors recommend (subject to audit) the payment of a dividend of 5½ per cent. on the cumulative second preference shares in satisfaction of the arrears to December 31st, 1916.

# STOCKS AND SHARES.

TUESDAY EVENING.

THE Stock Exchange had been looking forward to an early settlement of the coal strike, but Tuesday afternoon's markets were disturbed by extraordinary rumours as to the possibility of there being an immediate extension of the trouble which might involve railwaymen and the transport workers. The effect was to dim a brightness which has been fairly general over the markets. It brought down the prices of the War Loan and of oil shares, thus upsetting investment and speculative securities alike. The coming of Whitsun has combined with these rumours to circumscribe the volume of business, and the Stock Exchange once more adopts a waiting attitude.

This week's introduction of the Railway Bill in the House served as a strengthening factor in advance, its effect being particularly noticeable upon the Undergrounds. District ordinary stock has gone up to 17, and Underground Electric £10 shares rose 7s. 6d. to 2⅜, while the Income Bonds strengthened to 73½. Central London stocks are better. London General Omnibus 4½ per cent. debenture is up 1 to 68. London and Suburban Traction ordinary went back to half-a-crown.

Doubtless the details of the Bill will be public property before these notes are published, but it may be of interest to recall that the Stock Exchange expectation in regard to the railway grouping was that all the London (local) lines would be merged into one group, the idea being that, by such means, working expenses would be reduced, competition lessened, and savings effected in various ways. So far as the tubes are concerned, this particular aspect of the matter will scarcely come into play, because competition has been practically eliminated, and it may be reasonably assumed that working expenses can scarcely be reduced except through the medium of a fall in wages. The railway companies have already come to a preliminary and amicable arrangement with their men, on the wages question, when de-control of the railway industry shall take place i August. It is, indeed, this aspect of the matter which has helped to strengthen prices as much as anything else.

With the possibility of cheaper money, investment stocks are still in demand. Central Electric Notes have advanced to 4 premium, and the new ordinary stand at 1s. 3d. premium. Other new issues which have come out just lately are decidedly better. The Auckland 6½ per cents. offered not long ago at 100 are 3¼ premium, and the appetite of the public for such investments is insistent. Debenture stocks of all kinds, and preference shares as well, are brought into the survey of those who have money to put into Stock Exchange securities. The strike-extension fears laid a check upon the buoyancy that gave signs of developing, but prices of these stocks are well maintained.

It is worth noticing that, within the last few days, attention has turned to the shares of the various Indian electric concerns. There are not many of these; nor is there any appreciable amount of floating stock on offer. The buying movement has already reduced the available amount of stock in the market, and of the following quotations it may be said that, while we take the middle prices in the Stock Exchange Official List, a seller of to-day would probably find it no difficult matter to realise at these figures, while purchasers would have to give more, provided they were able to get the shares at all. These are some of the chief shares quoted :—

| | |
|---|---|
| Calcutta Electric Supply ordinary ... ... ... | 4⅛ |
| Calcutta Electric Supply preference ... ... | 3⅛ |
| Calcutta Electric Trams ordinary ... ... ... | 4¼ |
| Calcutta Electric Trams 5 per cent. preference ... | 2⅜ |
| Calcutta Electric Trams 4½ per cent. debenture ... | 84½ |
| Delhi Electric ordinary ... ... ... ... | 7s. |
| Delhi Electric preferred ... ... ... ... | 8s. |
| Indian Electric Supply ordinary ... ... ... | 15s. |
| Indian Electric Supply 7 per cent. preference ... | 16s. 3d. |
| Madras Electric Supply ... ... ... ... | 13s. 6d. |
| Madras Electric Supply 6 per cent. preference ... | 13s. |
| Madras Electric Tramways 6 per cent. preference | 2⅜ |
| Madras Electric Tramways 5 p.c. debenture stock | 84½ |

London electricity supply shares are all steady, and business is very quiet pending more definite development in connection with the Electricity Supply Bill. Those who are interested in the market are watching, of course, with close attention the various phases of the 1921 Bill, and further interest has been aroused by the combating of the idea that the Bill seeks nationalisation, or even semi-nationalisation, of the industry. A memorandum prepared by Mr. Leslie Gordon, hon. secretary to the Conference of Local Authorities owning electricity undertakings in Greater London, sets up a useful standard at which the Bill should aim, namely, to "stop the wasteful system of persisting in an inefficient and costly supply in many parts of the area by excessive capital expenditure on existing unsuitable generating stations."

Chelsea ordinary at 3½ and Charing Cross preference at 3 are both ¼ up. County of London 4½ per cent. first debenture and second debenture at 67½ and 66½ are about a couple of points higher.

Siemens shares improved to 25s. middle. The company announces a final dividend, making 10 per cent. free of tax for the year. At the same time it is announced that powers are to be sought, at the meeting on May 23rd, for the creation of one million 10 per cent. preference shares, of which 300,000 are to be offered as a bonus to holders of the ordinary shares in the proportion of one preference to five ordinary now held. The news came as a surprise, and, at first blush, the market was not altogether pleased at the idea of an amount so substantial being placed in front of the ordinary capital. Cromptons at 16s. 3d. are 1s. 3d. to the good.

Babcock & Wilcox are a little easier at 2 7/16, and English Electrics lost 6d. at 13s., although the preference at 14s. 6d. are better. Telegraph Constructions hardened to 20½, and the Cable group throughout is very firm, with rises in Anglo-American deferred, Eastern ordinary, Globes and Eastern Extension shares. Marconi's, after being 2 11/16, reacted to 2⅝, the preference shares being quoted at the same figure, while Marconi Marines are 28s. 9d. News from Mexico is a little more definite, but the various utility bonds and shares have not moved. The chairman of the Mexican Railway Co., who has recently returned from a visit to the country, reports that the capital presents a more prosperous appearance than at any time during the last twenty years. The United States Senate is again considering the question of recognising the present Government of Mexico, but it is assumed that a good deal more money will have to be spent before existing plant can be regarded as up-to-date and adequate.

The rubber market is lifeless, and amongst armament shares, a drop in Vickers to 13s. 3d. stands out as conspicuous after the previous rise to 14s. in the price of the shares. The iron and steel group had been tolerably firm until the rumours already mentioned in the first paragraph came into circulation. These caused slight reactions in most of the leading prices.

## SHARE LIST OF ELECTRICAL COMPANIES.

### HOME ELECTRICITY COMPANIES.

| | Dividend 1919. | Dividend 1920. | Price May 10, 1921. | Rise or fall. | Yield. p.c. |
|---|---|---|---|---|---|
| Brompton Ordinary | 12 | 12 | 6 | — | £10 0 0 |
| Charing Cross Ordinary | 7 | 8 | 8½ | — | 10 6 6 |
| do. do. do. 4½ Pref. | 4½ | 4½ | 8 | + ¼ | 7 10 6 |
| Chelsea | 4 | 6 | 8½ | + ¼ | 9 4 8 |
| City of London | 13 | 14 | 1⅞ | — | 11 16 0 |
| do. do. 6 per cent. Pref. | 6 | 6 | 17/- | — | 7 1 2 |
| County of London | 8 | 8 | 7⅞ | — | 10 9 10 |
| do. do. 6 per cent. Pref. | 6 | 6 | 8 | — | 7 10 0 |
| Kensington Ordinary | 7 | 9 | 4¼ | — | 10 18 2 |
| London Electric | 2½ | 2½ | 1 | — | 7 10 0 |
| do. do. 6 per cent. Pref. | 6 | 6 | 2⅝ | — | 10 18 2 |
| Metropolitan | 6 | 7 | 3⅞ | + ¼ | 10 7 4 |
| do. 4½ per cent. Pref. | 4½ | 4½ | 3⅛ | — | 7 7 0 |
| St. James' and Pall Mall | 12 | 12 | 6 | — | 10 0 0 |
| South London | 6 | 7 | 2¼ | — | 9 2 10 |
| South Metropolitan Pref. | 7 | 7 | 15/9 | — | 8 17 10 |
| Westminster Ordinary | 10 | 10 | 5½ | — | 9 15 2 |

### TELEGRAPHS AND TELEPHONES.

| | 1918 | 1919 | | | |
|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. | 6 | 6 | 78½ | — | 7 12 10 |
| do. Def. | 33/8 | 1½ | 15 | + ⅛ | 9 7 6 |
| Chile Telephone | 8 | 8 | 5½ | — ¼ | 8 6 8 |
| Cuba Sub. Ord. | 7 | 7 | 7⅜ | — | 9 6 8 |
| Eastern Extension | 10 | 10 | 16⅝ | + ⅛ | 6 2 2 |
| Eastern Tel. Ord. | 8 | 10 | 162½ | +1 | 6 8 0 |
| Globe Tel. and T. Ord. | 8 | 10 | 16⅜ | + ⅛ | 6 2 2 |
| do. do. Pref. | 6 | 6 | 9 | — | 6 13 4 |
| Great Northern Tel. | 22 | 22 | 223½ | + ⅜ | 9 18 4 |
| Indo-European | 18 | 10 | 30 | +1½ | 8 6 8 |
| Marconi | 25 | 25 | 2⅝ | — | — |
| Oriental Telephone Ord. | 10 | 12 | 2½ | — | *5 13 0 |
| United R. Plate Tel. | 8 | 8 | 6¼ | — | 6 10 8 |
| West India and Panama | 1/3 | Nil | 1/16 | — | Nil. |
| Western Telegraph | 8 | 10 | 10⅛ | — | *6 1 2 |

### HOME RAILS.

| | 1919 | 1920 | | | |
|---|---|---|---|---|---|
| Central London Ord. Assented | 4 | 4 | 45½ | +1 | 8 15 10 |
| Metropolitan | 1½ | 1½ | 25½ | — ½ | 5 17 8 |
| do. District | Nil | Nil | 17 | +1½ | Nil |
| Underground Electric Ordinary | Nil | Nil | 2⅜ | + ⅛ | Nil |
| do. do. "A" | Nil | Nil | 7/- | +1/- | Nil |
| do. do. Income | 4 | 2 | 73 | +1½ | 2 14 5 |

### FOREIGN TRAMS, &c.

| | 1918 | 1919 | | | |
|---|---|---|---|---|---|
| Anglo-Arg. Trams, First Pref. | Nil | 6½ | 2⅜ | — | 10 9 |
| do. do. 2nd Pref. | Nil | Nil | 8 | — | Nil |
| do. do. 5 % Deb. | 5 | 5 | 61½ | +2 | 8 2 8 |
| Brazil Tractions | Nil | Nil | 31 | — | Nil |
| British Columbia Elec. Rly. Pfcs. | 5 | 5 | 55 | — | 9 1 10 |
| do. do. Preferred | 2½ | 5 | 54½ | — | *8 14 6 |
| do. do. Deferred | Nil | 3 | 51½ | — | *11 17 6 |
| do. do. Deb. | 4½ | 4½ | 68½ | — | 7 5 4 |
| Mexico Trams 5 per cent. Bonds | Nil | Nil | 42 | — | Nil |
| do. 6 per cent. Bonds | Nil | Nil | 23½ | — | Nil |
| Mexican Light Common | Nil | Nil | 11½ | — | Nil |
| do. Pref. | Nil | Nil | 18 | — | Nil |
| do. 1st Bonds | Nil | Nil | 66½ | — | Nil |

### MANUFACTURING COMPANIES.

| | | | | | |
|---|---|---|---|---|---|
| Babcock & Wilcox | 15 | 15 | 2 7/16 | — 1/16 | 6 3 0 |
| British Aluminium Ord. | 10 | 10 | 13/3 | — | 13 6 2 |
| British Insulated Ord. | 12½ | 15 | 1⅞ | — | 9 12 0 |
| Callenders | 25 | 15 | 1¼ | — | 10 0 0 |
| ,, 6½ Pref. | 6½ | 6½ | 17/6 | — | 7 8 7 |
| Crompton Ord. | 10 | 10 | 16/3 | + 1/16 | 12 6 2 |
| Edison-Swan | 10 | 10 | 12/- | — | — |
| do. do. 5 per cent. Deb. | 5 | 5 | 70 | — | 7 2 10 |
| Electric Construction | 10 | 10 | 17/- | — | 11 15 4 |
| English Electric | — | 8 | 13/- | —6d. | 12 6 2 |
| Do. Pref. | — | 6 | 14/6 | +6d. | 8 5 6 |
| Gen. Elec. Pref. | 6½ | 6½ | 19/- | — | 6 16 10 |
| do. Ord. | 10 | 10 | 23/9 | —9d. | *8 8 0 |
| Henley | 25 | 15 | 1 1/16 | — | 10 9 8 |
| do. 4½ Pref. | 4½ | 4½ | 9⅛ | — | 6 18 6 |
| India-Rubber | 10 | 10 | ⅜ | — | — |
| Met.-Vickers Pref. | — | 8 | 1 1/16 | — | 9 9 8 |
| Siemens Ord. | 10 | 10 | 1½ | + ⅛ | *8 0 0 |
| Telegraph Con. | 20 | 20 | 20½ | + ½ | *5 13 4 |

* Dividends paid free of Income Tax.

# SUBMARINE CABLE TELEGRAPHY.

## Oscillatory Circuit Signal Conditions: Some Graphs, Tables, and Scales.

By EDWARD RAYMOND-BARKER.

(*Continued from p.* 576.)

23. Already the thought will have occurred to the reader that, considering the unsymmetrical sequence of electrical + and — impulses involved in the use of the customary equal-time dot-dash "cable code" for message traffic through a long submarine cable, the obtaining from the sending battery and transmitter, of an unfailing series of complete cycles or waves of alternate + and — sign, under the conditions here described, clearly is impossible. Likewise in the double-current *Morse* style of signalling now (in order to simplify Creed auto-typing requirements at terminals) coming extensively into use on certain amplifier-and-relay-linked cables, there certainly is a succession of current reversals, but the said sequence is unsymmetrical owing to the difference of duration in "dashes," as compared with "dots."

24. The fact is that only in General Squier's method of transmission with an unbroken current of alternating sine-wave electrical impulses, is an unfailing succession of complete cycles present. These regularly alternating sine-wave impulses of *rigidly uniform and equal time value*, constitute a system of symmetry absolute, excepting in so far as *amplitude* is varied in fulfilment of General Squier's conditions for control of "dot," "dash," and "space."

25. Here, one may mention that, in general practice, in the working of a cable, or series of cables, linked by Brown, Muirhead, "Dipper," or other cable relays, a test slip, or perforated band, to enable all stations to make any re-adjustments necessary, is occasionally run through a terminal transmitter. One of the main features of the said test slip which includes various standard types or series of signals, is a long series of reversals, each *positive* signal, and its corresponding *negative* reversal (or *vice versâ*), constituting—as has been shown—a complete wave or cycle (~).

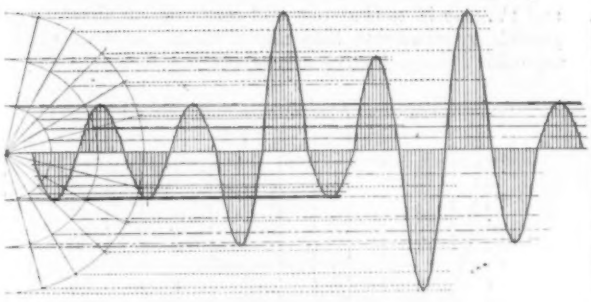

FIG. 3.

When Squier's unbroken alternating sine-wave current is the medium of signal transmission, special test slips are no longer necessary, the reason being that, in this system, the cable is ever "alive" and pulsating with equal-time + and — alternations varying in amplitude, but always constituting a truly symmetrical frequency. Fig. 3 is a graph showing the formation, in Squier's true sine-wave alternations, of the letters "A P." Fig. 4 also gives time-values for corresponding ordinary square-top impulse battery transmission, with "earth" intervals shown normal —though these last may be adjustable and varied, as in Muirhead's auto-transmitters.

26. True it is that Squier's excellent transmission conditions are, to a certain very limited extent, approached by John Gott's 2-power inverse-current method*, in which equal-time contact signals alternate in polarity, but vary in amplitude. In another field of work Pierre Picard† had previously obtained relative symmetry by his momentary-impulse electrical alternations respectively at start and at finish of each contact signal, whether long or short, with zero potential intervals—a system which revolutionised the working on many submarine cables of moderate KR, and brought into being, *inter alia*, the Paris-Algiers multiplex Baudot.‡ One does not like to dogmatise on these matters, but one would have thought "Picard" would be very usefully suitable under circumstances as sketched in the latter portion of 23.

27. Coming now to "A" (paragraphs 7, *a*, *b*, and *c*), one is faced with the desirability of synchronic coincidence between (*a*) the sending station's frequency in terms of complete cycles transmitted per second—which, in 20, we have seen to be l.p.m. ÷ 30 — and (*b*) the natural period of free electrical oscillations in the receiving oscillatory system at the other end of the cable, as shown in fig. 5 (simplex connections) and fig. 6 (duplex connections).

28. In the electrical oscillatory circuits embodied in figs. 5 and 6, the main factors to be considered are K = capacity, in microfarads, of receiving condenser, and L = inductance in henries of a Brown, a Heurtley, or a Muirhead inductance shunt. Regarding other symbols, H.R.S. = high resistance shunt on K; S R = series resistance (non-inductive) added to L; R = receiver; S = receiving shunt.

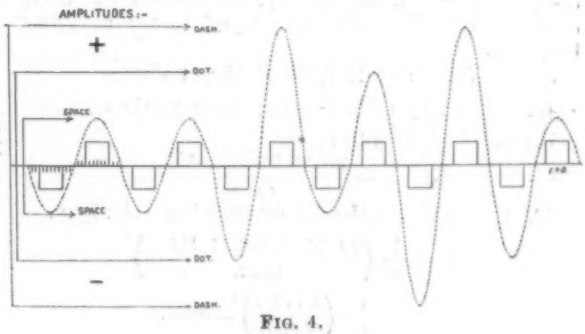


FIG. 4.

29. Admirably illustrated and tabulated matter cognate to the mutually influential action and co-operation between K and L — as well as to the parallelism to be found between electrical and corresponding mechanical conditions — is to be found in Chapters II, III, IV and V of Dr. C. V. Drysdale's "The Foundations of Alternate Current Theory."§

30. All that is required now, for comparison with the signalling frequency "*l.p.m.* ÷ 30" given in 20, is an expression giving the frequency of electrical oscillations (~ per second) present in the oscillatory circuit of reception, as shown in fig. 5 and fig. 6. Frequency, under these conditions, is the reciprocal of T the natural period, in fraction of a second, of each complete oscillation or cycle ~.

31. Dr. H. W. Malcolm, on p. 62 of his book, "The Theory of the Submarine Telegraph Cable,"‖ mentions that "The *natural* period of the free oscillations is fixed by the constants of the circuit. Let T be the periodic time; then—

$$T/\sqrt{KL} = 2\pi \text{ and } T = 2\pi\sqrt{KL}."$$

32. Or $T = \dfrac{\sqrt{KL}}{1/2\pi}$, when K is expressed in farads.

33. Or $T = \dfrac{\sqrt{KL}}{1{,}000 \times 1/2\pi}$, when K is expressed—as it will be in this instance—in microfarads.

* See "Alternating-Current Cable Telegraphy," by E. R.-B. in the ELECTRICAL REVIEW, August 20th, 1915.

† See "The Sounder in Submarine Telegraphy," by E. R.-B. in the ELECTRICAL REVIEW, February 28th, 1913.

‡ See letter from Mr. H. H. Harrison, in *The Electrician*, April 25th, 1913.

§ London, Edward Arnold, 1910.

‖ Benn Bros., Ltd., 8, Bouverie Street, E.C. 4.

34. The frequency of the oscillations (~) per second—as stated in 30—will be the reciprocal of T the periodic time.

35. So this frequency $= \dfrac{1{,}000 \times 1/2\,\pi}{\sqrt{K\,L}}$.

36. We are now able—in fulfilment of conditions and requirements mentioned in 30—to state the proportion thus :—

$$l.p.m. : 30 :: 1{,}000 \times 1/2\,\pi : \sqrt{K\,L}.$$

37. This proportion enables one to obtain L in henries suitable for a given K in microfarads, or *vice versâ*.

38. In the first instance, let K be fixed. It is required to know, for a given K and for a given signalling speed in *l.p.m.*, what is the self-induction or inductance which, in co-operation with K, will give in the electrical oscillatory circuit of reception a frequency equal to the signalling frequency.

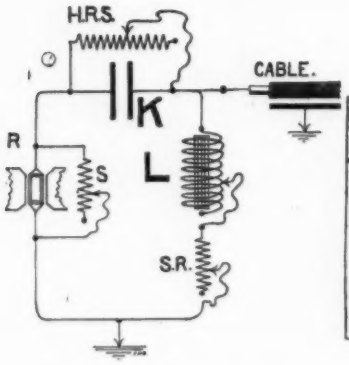


FIG. 5.

| l.p.m. | $\frac{4774\cdot7}{l.p.m.}$ | l.p.m. | $\frac{4774\cdot7}{l.p.m.}$ | l.p.m. | $\frac{4774\cdot7}{l.p.m.}$ |
|---|---|---|---|---|---|
| 100 | 2279·7 | 325 | 215·83 | 550 | 75·364 |
| 125 | 1459·0 | 350 | 186·10 | 575 | 68·951 |
| 150 | 1013·2 | 375 | 162·12 | 600 | 63.326 |
| 175 | 744·40 | 400 | 142·48 | 625 | 58.361 |
| 200 | 569·93 | 425 | 126·21 | 650 | 53.959 |
| 225 | 450·32 | 450 | 112·58 | 675 | 50.036 |
| 250 | 364·76 | 475 | 101·04 | 700 | 46.525 |
| 275 | 301·46 | 500 | 91·190 | 725 | 43.372 |
| 300 | 253·30 | 525 | 82·711 | 750 | 40.529 |

TABLE II.

| K mfds. | l.p.m.=100. L(henries)= $\frac{4774\cdot7^2}{l.p.m.}$ = K | l.p.m.=200. L(henries)= $\frac{4774\cdot7^2}{l.p.m.}$ = K | l.p.m.=300. L(henries)= $\frac{4774\cdot7^2}{l.p.m.}$ = K |
|---|---|---|---|
| 20 | 113·99 | 28·496 | 12·665 |
| 30 | 75·991 | 18·998 | 8·4435 |
| 40 | 56·993 | 14·248 | 6·3326 |
| 50 | 45·595 | 11·399 | 5·0661 |
| 60 | 37·996 | 9·4990 | 4·2218 |
| 70 | 32·567 | 8·1418 | 3·6186 |
| 80 | 28·496 | 7·1241 | 3·1663 |
| 90 | 25·330 | 6·3326 | 2·8145 |
| 100 | 22·797 | 5·6993 | 2·5330 |
| | KL=2279·7 | KL=569·93 | KL=253.30 |

TABLE III.

| L Henries | l.p.m.=100. K (mfds.)= $\frac{4774\cdot7^2}{l.p.m.}$ = L | l.p.m.=200. K (mfds.)= $\frac{4774\cdot7^2}{l.p.m.}$ = L | l.p.m.=300. K (mfds.)= $\frac{4774\cdot7^2}{l.p.m.}$ = L |
|---|---|---|---|
| 5 | 455·95 | 113·99 | 50·661 |
| 10 | 227·97 | 56·993 | 25·330 |
| 20 | 113·99 | 28·496 | 12·665 |
| 30 | 75·991 | 18·998 | 8·4435 |
| 40 | 56·993 | 14·248 | 6·3326 |
| 50 | 45·595 | 11·399 | 5·0661 |
| 60 | 37·996 | 9·4990 | 4·2218 |
| 70 | 32·567 | 8·1418 | 3·6186 |
| 80 | 28·496 | 7·1241 | 3·1663 |
| | KL=2279·7 | KL=569·93 | KL=253·30 |

TABLE IV.

39. $l.p.m. : 30 :: 1{,}000 \times 1/2\,\pi : \sqrt{K\,L}$,

40. $l.p.m. \times \sqrt{K\,L} = 30 \times 1{,}000 \times 1/2\,\pi$.

Dividing both sides by *l.p.m.*,

41. $$\sqrt{K\,L} = \frac{30 \times 1{,}000 \times 1/2\,\pi}{l.p.m.}.$$

42. Squaring both sides and dividing both sides by K,

$$L = \frac{1}{K}\left(\frac{30 \times 1{,}000 \times 1/2\,\pi}{l.p.m.}\right)^2$$

$$= \frac{1}{K}\left(\frac{4{,}774\cdot7}{l.p.m.}\right)^2 \text{henries}.$$

43. In the second instance, let L be fixed, while one requires to know the inductive capacity in microfarads K, which, in co-operation with L, and with a given signalling speed in *l.p.m.*, will give, in the electrical oscillatory circuit of reception, a frequency equal to the signalling frequency.

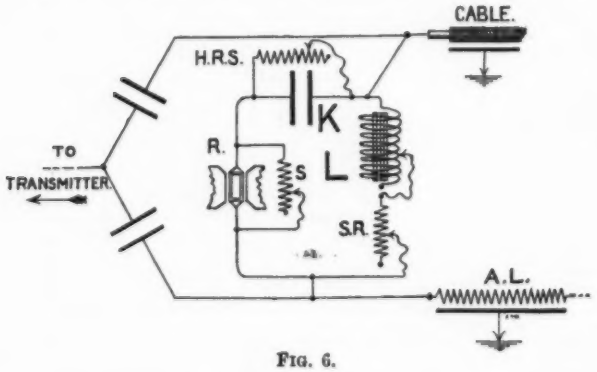


FIG. 6.

44. Reverting to 42 : By dividing both sides by L, and proceeding as before, one obtains :—

45. $K = \dfrac{1}{L}\left(\dfrac{4{,}774\cdot7}{l.p.m}\right)^2$ microfarads.

46. Obviously the expression $\left(\dfrac{4{,}774\cdot7}{l.p.m.}\right)^2$ may be worked out once and for all for every conceivable value of *l.p.m.* that possibly may be required. The several numerical equivalents may be tabulated for future use and reference, as shown in Table II. Any one of these equivalents, on being divided by any particular K (or multiplied by the corresponding reciprocal, as most convenient for slide-rule work) will give the required L. Likewise, dividing it by a known L will give the required K.

47. Table III gives, for speeds 100, 200 and 300 *l.p.m.*, the relative inductances L severally for nine different capacities K.

48. Table IV gives, for speeds 100, 200, and 300 *l.p.m.*, relative capacities K severally for nine different inductances L.

49. These tables may be used conversely.

50. A booklet of tables, on the model of Tables II, III, and IV, may be worked out and compiled, suitable for any possible requirements that may arise in the working of any cable station, or any chain of cables.

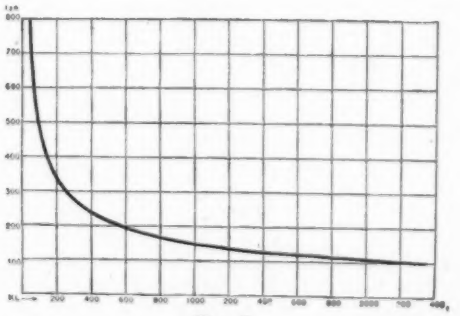

FIG. 7.

51. Figures at the base of Tables III and IV illustrate how the product of the correct K and L for any given oscillatory frequency, at any given signalling speed, is always a certain fixed value. A curve illustrating this is shown in fig. 7, in which ordinates are *l.p.m.*, and abscissæ the uniform sequence of products K L.

*(To be concluded.)*

**Belgian Electrical Progress.**—In the report of the Société des Ateliers de Constructions Electriques, of Charleroi, for last year, which has just been issued, it is stated that the company is now giving employment to 3,600 workmen, as against only 2,443 when the war broke out in August, 1914. The works are now turning out all classes of electrical material from motors of ½ h.p. up to generators and motors of no less than 15,000 to 20,000 h.p., the latter being a development in connection with the electrical driving of rolling mills in iron and steel works, these large motors for the metallurgical industry in Belgium having hitherto been imported. Developments have also taken place during the past year in connection with the construction of electric welding, engines and pumps for collieries, electric signalling apparatus for railways and mines, while extensions have also taken place in the cable factory where all types of electrical and telephone cables are now being produced.

## THE DAYSOHMS LOW-PRESSURE A.C. WELDER.

On the invitation of Messrs. Daysohms, Ltd., we recently visited their laboratory to see a demonstration of their new arc-welding set, which is a development of the Daysohms automatic current limiting regulators already described in our pages.

For the purpose of electric arc welding it is not necessary that the current should be mechanically regulated through its whole range, as shown in the previous descriptions of the regulators. To enable an arc to be struck and subsequently drawn out with as little as 50 volts on open circuit, it is essential that for an instant, when the arc is being struck, there should be very little choke in series, but as soon as the arc is established a relatively greater choke must be introduced in series to stabilise it, and keep the current within the desired limits.

In the case of hand-operated electrodes it is impossible to maintain exact current and voltage values, through and across the arc. Under the same electrical conditions the average values of these factors will vary with various makes of electrodes, various thicknesses of work with the same electrode, and also with various operators doing the same work with the same type of electrode. Also, owing to the unavoidable variation of the length of the arc due to the hand of the most skilled operator, and a bubbling of the molten metal and slag forming the terminals of the arc, and also owing to the inherent tendency of an arc to set up rapid variations of its own, the instantaneous variations of the voltage wave across the arc vary widely from the impressed voltage wave. Rapid variations of a duration of 1/2,000th sec. and less have been observed with an oscillograph.

It is also impossible for an operator to maintain an arc and read an ammeter at the same time, without varying the current he is taking from that he would be taking when only welding.

In consequence of the above facts, it is considered quite unnecessary to install either a voltmeter or an ammeter *provided* a regulator which can be simply and continuously set between the maximum and minimum current values is used. Under these circumstances the weld itself is the best indicator of whether the correct electrical values are being used.

In the Daysohms low-pressure a.c. arc welder there is one adjustment only, the hand-screw shown in fig. 1. A fraction of a turn frees the screw, and it may then be slid up or down the slot and clamped at any point, turning the average value of the current down or up precisely as a gas flame may be varied.

The construction and operation of the machine is as follows: The electromagnetic portion consists of a stator and rotor

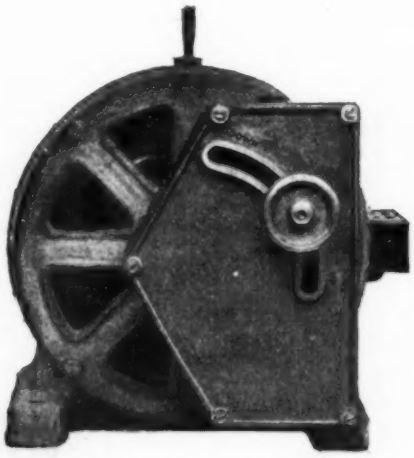

Fig. 1.—The Daysohms a.c. Welder.

wound as a two-pole machine; the stator and rotor windings are connected in series with one another and in series with the arc. There are rather more turns on one member than on the other. In one position of the rotor, when the stator and rotor coils are all in one plane, the choke introduced in the circuit is due to the *difference* between the stator and rotor windings, and is quite small; this is the position for striking the arc. When current flows there is a torque set up between the rotor and the stator. This torque is to some extent counterbalanced by a fixed spring, and the speed at which the rotor can turn is regulated by a fixed dash-pot.

If the rotor can revolve 180 deg. the choke increases as it turns until it reaches a value due to the *sum* of the turns on the stator and rotor windings, and the current and pressure across the arc are reduced to the lowest value; the amount to which this reduction can take place is set by the position of the hand screw.

This hand screw terminates in a pin projecting into the case, against which an arm fixed to the rotor shaft can engage; the position of the pin fixes the angle through which the rotor can rotate, and, therefore, the amount to which the current will be reduced. This is the only adjustment.

On striking the arc, a very considerable torque is set up between the rotor and stator, and the rotor would deflect so rapidly that there would not be time to volatilise the small bit of electrode required to set up the arc; a dash-pot is, therefore, provided to control the speed at which the armature deflects, and as the torque at striking is the same, irrespective of the ultimate current that the regulator is set for, the dash-pot is set, and does not require any regulation.

This dash-pot, however, plays a more important part in the regulation; the piston is provided with a valve so that it retards the rotor in one direction only, and it is free to return

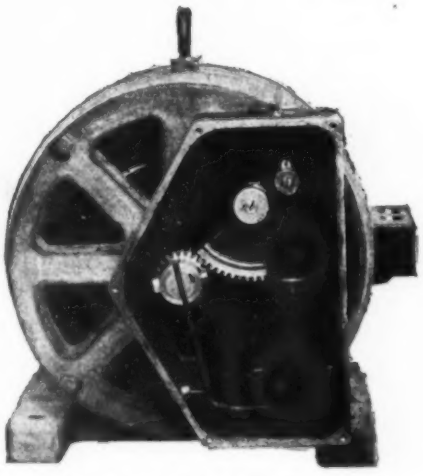

Fig. 2.—Mechanism of Welder.

as rapidly as possible to the zero position under the pull of the controlling spring, with the result that when the arc is struck the pressure across it is reduced at a speed controlled by the dash-pot, but if, owing to the spluttering of the arc, its resistance is suddenly raised, the rotor can drop back and raise the voltage, catching the arc, as it were, before it goes out.

At the time of our visit various electrodes were employed, and excellent results were obtained, demonstrating that the welder was capable of working with 40 to 60 volts on open circuit, according to the type of electrodes used. Once set to suit a particular job, the welder needs no attention, and several welders can be fed from a single transformer.

---

**Russian Industry under the Bolshevist Rule.**—The Russian railways are in a disastrous condition; on all sides is to be noted the lack of fuel and rolling stock. The track and bridges are in a shameful state. Repairs to track are made from material removed from branch-lines or even from other main-lines. Passenger trains run at a speed of 5 to 14 kilometres per hour. The Government has installed locomotive works at Sormorow, Kolumnad, and Brjansk, steel-plate works at Wykas, and wagon shops at Twer and Moscow. These works have promised to undertake a definite amount of work during a certain period. The Sormorow plant, for example, was entrusted with the production, under six months, of eight new locomotives, heavy repairs to 30 locomotives, and the manufacture of a certain number of spare parts. The works, which employs some 8,500 workers, simply did the following:—New locomotives, none; locomotives repaired, 14; and about 80 per cent. of the number of spare parts promised. The results from the other factories were similar, and their reports show unanimously that the cause of this is lack of fuel and lack of competent workmen. An equally deplorable condition exists in river transport. The fleet of oil boats on the Volga consists of 190 vessels—a totally inadequate number. Information from other industrial centres indicates that the diminution in the number of skilled workmen is general throughout Russia. The greater part of the operatives are now either working on the land or have been turned into public servants, of which there is one to every seven inhabitants. It is obvious that the representatives of the Bolshevist Government are well aware of the complete breakdown of its methods, as can be seen by the concessions on a large scale which they are conceding to foreign capitalists. The capitalists, nevertheless, who have entered into negotiations do so at great risk, seeing that the Bolshevist Government, whatever may be its intentions, will find it exceedingly difficult to fulfil its guarantees.—*Ingenieria Internacional.*

# MAGNETOS FOR INTERNAL-COMBUSTION ENGINES.

By A. E. WATSON, A.M.I.E.E.

*(Abstract of paper read before the* Institution of Electrical Engineers.)

*(Concluded from page* 599).

Sparking should be independent of the material of which the contact points are made, whereas only certain metals, such as platinum and iridio-platinum, which do not form oxides when heated, can be employed, and even with these metals the sparking is largely affected by the condition of the points themselves, and can be greatly increased by the presence of small traces of dirt and impurities. The problem is not so much the suppression of true sparking as that of the condenser preventing local heating of the points which would tend to vaporise the metal and make conditions favourable for the production of an arc. Such local heating could be reduced by using a large number of turns in the primary winding, and actually sparking is thus diminished beyond the value at present customary, and true sparking sets in of an appearance quite different from that of the arcing usually known by this name. At present these conditions are not employed, as the voltages to which the insulation of the condenser and contact breaker would be subjected are considerable.

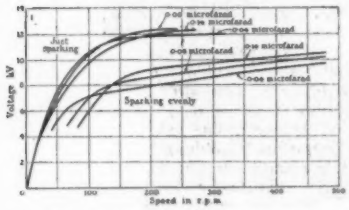


Fig. 7.—Effect of Condenser Capacity on Low-speed Voltage Curves.

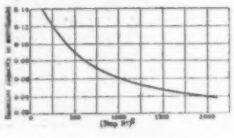

Fig. 8.—Effect of Varied Condenser Capacity on Sparking.

Fig. 7 shows the way in which the secondary voltage of a given machine changes with variation in condenser capacity, and fig. 8 shows the intensity of sparking at the points in terms of the condenser capacity, the sparking being determined by observing the image of the contact breaker on the ground glass of a camera, and finding the size of iris diaphragm which would just render it invisible. The capacity required to render a machine quite sparkless is considerably greater than that which gives the highest voltage for a given low speed, hence the capacity fitted is a compromise.

Depending upon the characteristics of the spark-gap and the machine, there will be a speed at which the flux change at break will be sufficient to raise the capacity of the secondary circuit to the breakdown potential of the gap. Provided the flux-change is only just sufficient to enable this voltage to be attained, the spark will be a capacity spark, and oscillatory, of extremely high frequency and short duration, as the circuit in which it flows has little or no inductance. Consequently, very large currents may exist in it, although only for a brief period of time, and it is undoubtedly this first white spark which produces ignition of the charge. After the passage of the initial spark, we are left with a certain proportion of the working flux still distorted and a further quantity of energy available. This energy is now communicated to the secondary circuit, but as the passage of the initial spark has left the spark-gap in a highly conducting condition, the discharge will follow the law governing the decay of current in an inductive circuit.

Although the flame which follows the initial spark is valueless from the point of view of ignition, it is particularly important that at all speeds the flaming portion of the spark shall have died out and that the secondary current shall have ceased before the primary circuit has been closed again. Unless this is the case, the flux in the armature core will not have been able to re-form, and consequently the energy available in the succeeding spark will be correspondingly reduced.

To make extinction as complete as possible we, therefore, require to use as long a cam as possible, keeping the contact points open for the greatest possible angle consistent with the provision of the short-circuited winding necessary for producing field distortion. The additional spark-gaps sometimes inserted in the secondary circuit and provided in all jump-spark distributors increase the total resistance of the spark-gap circuit and thereby reduce the spark duration. There are undoubtedly certain conditions of operation in which a jump-spark distributor will give more satisfactory ignition than one in which the distributor rotor makes actual metallic connection.

The inductance of the secondary winding can be controlled by modifying the shape of the pole-tips, and also to a slight extent by changing the number of secondary turns. To obtain a satisfactory compromise between all the factors involved is difficult, but the following principles will form a basis for the correct relationship between them:—(*a*) The number of secondary turns to be the least which will satisfy low-speed conditions. (*b*) The reluctance of the flux path to be such that under the worst conditions of high speed and maximum flux distortion the point of maximum B H is not exceeded. (*c*) The duration of open circuit of the primary winding to be as large as possible, i.e., the points should be held open from the sparking position until the axis of the H armature is across the pole-faces or slightly beyond this position. This in most machines corresponds to a duration of "make" of 100 deg. and of "break" of 80 deg., the break occurring at approximately 10 deg. past the mid-position of the armature. These angles have been standardised by all the British magneto manufacturers.

Curves 1 and 2 in fig. 3, p. 599, show the effect of incomplete spark extinction in reducing the output of the same machine, fitted in one case with a cam opening for 80 deg. and in the other for 12 deg. Fig. 9 shows the "utility" figures for a similar pair of machines. A short-cam machine will tend to miss alternate sparks, and it can frequently be made to give either positive or negative sparks at will; fig. 10 shows the results of tests made on a machine which was liable to misfire on alternate gaps, and in which an electromagnet was fitted in place of the ordinary permanent magnet. Thus putting a better magnet in a magneto may not always be a cure for missfiring but may even make it worse.

The author summarises the results of his reasoning as follows:—

(1) *Low-speed voltage.*—Dependent upon available magnetic energy, primary resistance, speed of rotation, number of secondary turns, energy losses, and condenser capacity. Increases with increasing speed up to a limiting value, which increases with increase in available magnetic energy.

(2) *Utility.*—At high speeds proportional to magnetic potential of distorted field and inversely proportional to number of secondary turns. At low speeds dependent upon speed and primary resistance.

(3) *Energy in initial spark.*—At high speeds proportional to available magnetic energy. Dependent upon losses in iron of armature, &c., and to a certain extent on condenser capacity.

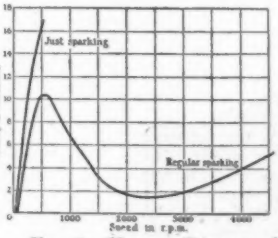


Fig. 9.—Utility Test on Short-cam Magneto.

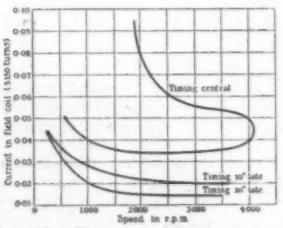


Fig. 10.—Effect of Incomplete Spark Extinction.

If losses were absent the energy would be independent of the voltage, but, owing to their presence, the energy decreases as the voltage is raised. At low speeds it is dependent upon speed and primary resistance.

(4) *Total energy in spark and flame* follows the same law as the energy in the initial spark, but is greater in value. Theoretically the total energy may be twice that in the initial spark. This energy is approximately that stored in a magnetic field of value 2B at a potential of H and is $2B H/(8\pi)$ or $B H/(4\pi)$. If, instead of allowing this field to collapse suddenly, we maintain the potential H until B=0, additional work $B H/(4\pi)$ will be done upon the field, and the total available energy will be $B H/(2\pi)$.

(5) *R.M.S. value of current in secondary circuit.*—Depends upon characteristics of magneto itself and also to a very large extent upon the spark-gap resistance. A magneto may be made to give almost any reading desired upon a hot-wire ammeter, by altering the constants of the circuit. In particular, adding capacity to the terminals will increase the reading several fold.

## Discussion in London.

The President (Mr. Ll. B. Atkinson) commented on the fact that such a piece of apparatus as the magneto should have been built up on empirical lines, not without much experimental work, of course, but empiricism was the hall-mark of the Continental machine. Localised products of that nature were frequently of a high quality, but often when attempts were made to manufacture them elsewhere many

alterations in method became necessary. The paper showed clearly how quickly research work could improve an article, and had resulted in the production of a British-made magneto the equal of any in the world. The paper was very clearly written.

Mr. C. C. Paterson explained that the author was one of the small band of men who had had to face the elucidation of the whole technique and theory of the subject and at the same time produce an enormous output of magnetos. He agreed with the paper; the characteristics and design of the magneto were not governed by the conditions necessary to produce ignition as energy was unimportant from the point of view of ignition. Practically all the energy a magneto had to furnish was expended in counteracting the leakage which always existed in the plugs, cable, &c., so that the necessary potential between the plug points could be built up. Together with Dr. Campbell he had shown that as regarded actual ignition, the quantity of electricity passing between the points of the plug was unimportant; whether a spark was "fat" or otherwise had no effect on the power obtained from the engine. Only about 1/70th of the energy supplied by the magneto, or about 1/1,000th joule, was required solely for the purpose of ignition. The first portion of the discharge, which lasted for about one-millionth of a second, did the work, and into it most of the energy should go; the rest of the energy which followed was not required.

Dr. N. W. McLachlan discussed the determination of the efficiency of magnetos, and pointed out that Dr. T. Jones had shown that, under ideal conditions, the ratio of the electrostatic energy stored in the secondary to the electromotive energy stored in the primary winding just before the contact points opened gave an efficiency of about 20 per cent. The speaker's own experiments indicated that the whole of the loss was due to hysteresis and eddy currents in the iron, and he suggested that more information on that point could probably be obtained by building the armature laminations into a non-metal frame. There was one oscillation of low frequency and high amplitude and another of lower amplitude and a fairly high frequency; inductance depended on the value of those two frequencies, and a decrease in inductance meant a smaller secondary peak voltage, and, therefore, less efficiency. They were chiefly concerned with the maximum voltage a magneto gave, not its rate of rise, and if it was high enough the necessary ionisation at the gap was a function of the pressure and its time of application. Nevertheless the voltage required to produce the necessary ionisation was greater the more rapidly it rose and, therefore, for any given plug leakage there must be a compromise between the maximum pressure and its rate of rise.

Prof. E. W. Marchant regretted that information he had intended to give the meeting had not come to hand. The most important part of the paper was its indication of the importance of minute and detailed testing of materials, and new steels would probably revolutionise the industry. Oscillograph records of the p.d. in the spark gap and the current flowing in the primary circuit of a magneto working with different gas mixtures indicated that there were large differences in the peak voltage under different working conditions.

Mr. J. F. Kayser compared the advantages of various magnet steels, saying that the demagnetising rates of two steels should first be determined, and then the flux of the two magnets. Dividing the total energy of a tungsten-steel magnet by the maximum energy per cu. cm. of a cobalt-steel magnet would give the necessary value for obtaining the same result. The original area of the tungsten magnet multiplied by the flux density at which it worked divided by the flux density at the point at which the cobalt steel would give its maximum available energy gave the new cross sectional area necessary. Magneto manufacturers made an unnecessary amount of fuss about remanence, which was useless practically, but interesting academically. The only criterion of magnetic worth was BH maximum.

Capt. A. B. Burgoyne explained that research work at Farnborough was still "going strong"; a good deal of practical experimental work was done, and the Air Ministry was anxious to assist manufacturers to meet the requirements of the Air Service, in which conflicting and special conditions were met with. It was a much stiffer problem to produce apparatus to operate successfully on aircraft. A higher voltage was necessary, and the magneto had to operate in air of rare density and low temperature, though the magneto itself might be exposed to considerable heat. It was also necessary to electrically screen off the wireless gear and, therefore, metal-braided h.p. cable had to be used, thus introducing additional leakage. A specification drawn up by the Air Ministry in conjunction with the Magneto Manufacturers' Association laid down that a magneto must fire a plug having a leakage of 200,000 ohms, whilst running at 3,000 r.p.m. Moreover, it must function properly after running over 48 hours in a saturated atmosphere, while after operating at a temperature of 120 deg. F. it must run for 500 hours and give satisfactory performance at 200 r.p.m., obviously more severe conditions than the author's utility test. After testing machines of almost every make, his considered opinion was that any British magneto was superior to the best American one; French and German machines ran closely to each other, but while the "Bosch" was of excellent workmanship, and ran well under bad conditions, much attention having been paid to detail, its design was bad, and electrical performance indifferent. The workmanship of the British magnetos was often poor, though they were at least equal to the "Bosch." The size and price of magnetos should be reduced by the extended use of cobalt steel.

*(To be continued.)*

## JOINT ELECTRICITY AUTHORITIES.

### London and Home Counties District.

In connection with the local inquiry which the Electricity Commissioners are to hold at the Institution of Electrical Engineers on June 14th and following days into the reorganisation of the existing supply of electricity in, and the formation of a Joint Electricity Authority to control, the above-named area, six schemes have been submitted by interested authorities for consideration at the inquiry. The following are abstracts of the schemes.

### L.B. & S.C. Railway Co.'s Scheme.

The London Brighton & South Coast Railway Co. ("the Brighton Co.") is working parts of its London and suburban lines by electric traction. Prior to the war and subsequently considerable progress has been made in the work of equipping the remaining portions of such lines for similar working, and the Brighton Co. anticipates that this work will be completed in the near future. For the purpose of electrically working the first-mentioned parts of its London and suburban lines the Brighton Co. is taking from the London Electric Supply Corporation, Ltd. ("the Supply Corporation"), over 16,000,000 Board of Trade units of electricity per annum, and when the electrification of its London and suburban lines is complete it will require a supply of energy estimated at about 125,000,000 units per annum.

The Brighton Co. is under contract with the Supply Corporation to take from it up to 30,000,000 units per annum, and (subject to certain special provisions) the contract cannot be determined before December 31st, 1926. A comparatively small quantity of the electricity supplied to the Brighton Co. is used for purposes other than electric traction.

It is of vital importance that an adequate supply of electricity should be constantly available at the lowest possible cost for working such lines, and the Brighton Co. considers that this can best be effected by the following scheme:—

The Brighton Co. would arrange, or co-operate with the Supply Corporation in arranging, for the erection and equipment of a large generating station on a suitable site, which it is proposed should contain sets of 25,000 kW. each generating at a frequency of 25 periods, and that it should have an ultimate capacity of about 125,000 kW. The Brighton Co. and the Supply Corporation will agree so to operate their respective generating stations that any spare plant installed will be used to the best mutual advantage. After meeting its own needs the Brighton Co. would sell the surplus energy on reasonable terms to the Supply Corporation and to other authorised undertakers adjoining or near its railway.

### G.E. Railway Co.'s Scheme.

The Great Eastern Railway Co. is, by the Great Eastern Railway Act, 1903, empowered to work by electrical power the traffic on its railways and on railways leased to or worked by it, and for that purpose to lay down apparatus and to make the necessary alterations in those railways and in any of its stations and works.

The company's scheme consists in the construction of a generating station, and to install generating plant up to the total capacity of approximately 120,000 kW., and to subsequently extend the installation of generating plant as required up to the total capacity of the site which is approximately estimated at 225,000 kW. The G.E. Co. is advised that the load necessary for the electrical working of its railways is, both as regards size and load factor, such as to enable the proposed generating station to be economically installed and operated. The system of supply will be three-phase at 50 cycles per second. The main transmission pressure will be 33,000 volts, and the secondary local transmission pressure (if required) 6,600 or 11,000 volts.

Under powers contained in the Great Eastern Railway Act, 1915, the company acquired certain land at West Ham lying between its railway at Thames Wharf and the river Thames and Bow Creek, one of the principal objects of acquiring such land having been with a view to its special suitability as a site for the erection of a proposed generating station for the purposes of working the company's railways by electric traction in accordance with its statutory powers. It is proposed that the generating station should be constructed and operated by the G.E. Railway Co., and the company is prepared, so far as it is or may be authorised, to assist generally in promoting the efficient and economical supply of electricity within the district by the supply of any surplus energy for use by other railway companies associated with it or by the Joint Electricity Authority or authorised undertakers to the best mutual advantage.

### Poplar Borough Council's Scheme.

The draft scheme submitted by the Metropolitan Borough of Poplar, E. (Mr. J. Horace Bowden, M.I.E.E., being general manager and chief engineer of the electricity supply undertaking) proposes to modify the area already delimited by the Electricity Commissioners, and that a Joint Electricity Authority to be called "the East London and District Electricity Authority" shall be established for the district, which shall consist of (*a*) twenty-two members of the Councils of all local authorities being authorised undertakers and distributors within the district; (*b*) seven members of the Councils of all local authorities having the right to purchase the whole or part of the undertaking of any authorised undertakers within the district; (*c*) three members of all County Councils partly within the district; (*d*) three members representative of large consumers within the district, who shall be appointed by the Minister of Transport, and (*e*) two members representative of labour employed in the supply of electricity within the district, who shall be appointed by the Minister of Transport.

After dealing with administration and powers, the latter including the manufacture of gas and the supply of hot water, steam, electrical apparatus, &c., the scheme sets forth the technical proposals as under [see Electrical Review, January 21st, 1921, p. 93]:—

The system of supply to be three-phase a.c., having a frequency of 50 cycles per second. The main primary transmission pressure shall be from 30,000 to 33,000 volts between phases, and the local secondary transmission pressure shall be from 6,600 to 11,000 volts between phases.

It is not proposed that any of the existing generating stations should be discarded immediately, but that they should remain in being so long as economic conditions justify; having regard to any cheaper and more reliable supply which may be available either by the interconnection of the various existing generating stations or from new capital stations proposed to be erected, but so soon as possible after the establishment of the Electricity Authority, the Authority shall appoint an advisory committee or committees of the engineers of all participating authorised undertakers which shall forthwith prepare to advise the Electricity Authority on the most efficient organisation of the finance, control, co-ordination, and operation of the existing generating systems in the prescribed area as will best secure convenience of administration and economy of production.

It is proposed that the existing generating stations within the district shall be inter-connected forthwith, and inter-connection shall be carried out in groups; in each group one station shall be selected as a primary supply station, and another as a secondary supply station; the selection will be based upon the most economic plant within each group. All the remaining stations within each group will close down during hours of "light load"; the primary and secondary stations will supply alternatively over each week-end light-load period, and the primary station will supply during night light-load periods. The existing generating stations within the district on the north of the Thames already inter-connected are those of the metropolitan boroughs of Hackney, Poplar, Shoreditch, and Stepney; the latter also supplying all the electricity requirements of the metropolitan borough of Bethnal Green. The North Metropolitan Electric Power Supply Co.'s generating station at Brimsdown is inter-linked with the generating station of the metropolitan borough of Hackney, and the same company supplies in bulk to the metropolitan borough of Stoke Newington.

It is proposed to extend inter-connection to the metropolitan borough of Islington to complete the group in the metropolitan area of the district, and to form a separate group by laying inter-connecting mains between the generating stations of the county boroughs of West Ham and East Ham, and the Urban District Councils of Barking Town, Ilford, Leyton, and Walthamstow. From the latter group the undeveloped areas of Wanstead and Woodford and others could be supplied. On the south of the Thames it is proposed that all authorised undertakings within the district shall be grouped in a similar manner.

The erection of a new capital station is proposed at Dagenham on a site which offers exceptional facilities for the delivery of materials, for coal handling, and for ash disposal. The capacity of the proposed initial station is 100,000 kW, the site being capable of accommodating an ultimate capacity of 400,000 kW. The preliminary drawings have been prepared, and together with the consultant's report, will be submitted to the Commissioners.

It is not proposed that any works shall be constructed by the Ministry of Transport under Section 18 of the Act.

It is not proposed that any existing generating station used solely for (*a*) railways or (*b*) tramways shall be immediately included in this scheme, but it is desirable that no such stations shall be extended provided that the Electricity Authority can prove to the satisfaction of the Commissioners that it (the authority) can meet the requirements. It is also desirable, having regard to the standardisation of frequency, that as the existing 25-cycle and 33⅓-cycle plant becomes obsolete, 50-cycle plant shall be substituted therefor, and the necessary supply taken from the Electricity Authority. All new supplies for railways and tramways within the district (or beyond with consent of the Commissioners) shall be provided by the Electricity Authority.

The remainder of the scheme deals with the financial arrangements proposing that the Electricity Authority may, with the sanction of the Commissioners, borrow money, provide a reserve fund, and adjust the charges made for electricity supplied so as to meet deficiencies or *vice versa*.

*(To be concluded.)*

## CORRESPONDENCE.

*Letters received by us after* 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

### The Wiring of Ferro-concrete Factories.

I will only occupy your valuable space to make the following remarks:—

1. I have already explained why I joined in this correspondence, and it should be clear that it was not out of prejudice against C.T.S. cable. I may add that I am not unimpressed by the good accounts given of this system of wiring.

2. The buildings with which I am concerned are not of ferro-concrete, but of corrugated iron or brick. Neither are they factories within the meaning of the Factory Acts, but they are subject to such conditions generally as local authorities care to impose. The last paragraph of my letter in your issue of April 15th should have made it clear that my remarks did not apply to the proper subject of this correspondence.

3. With regard to the question of fire hazard, I only raised this in the first instance as a possible reason for "Inquirer's" original remark.

If the experience of "Two Phase" is a common one, there would appear to be some reason for his condemnation of screwed conduit. I should like, however, to draw his attention to a letter in your issue of March 25th, from which it is apparent that the authorities at Vancouver consider that screwed conduit should alone be permitted in that part of the town where the most valuable and modern houses are located, and it is added that this is considered the only system that comes up to the requirements of modern fireproof buildings.

I do not pretend necessarily to uphold the last statement, and it is quite possible that the use of C.T.S. may not have come into so much prominence there as here.

The experience of other readers who have had fires on their effects on various systems of wiring would, I should think, be interesting and valuable. Perhaps some insurance officials would be so kind as to remark upon it.

**A. C. Purday.**

Croydon.
*May 3rd*, 1921.

### Telephone Cables for use on Power Schemes.

With reference to Mr. Riley's letter in your issue of April 29th, I would point out that my figures for the cost of solid impregnated paper-insulated cables were based on the use of a thickness of insulation between conductors and between conductors and sheath of 80 mils. This because it is usual for this type of cable to be ordered "in accordance with the B.E.S.A. standards."

I am aware that this thickness is unnecessary and, in my article, gave the reasons. This type of cable is uneconomical, and its use can rarely be justified even with the thickness of insulation deemed necessary by Mr. Riley.

With regard to the transmission distances given in the article, I should have stated that they referred to type 2 cable (loosely insulated with impregnated paper), and are therefore not directly comparable with either of the series of figures given by Mr. Riley. I admit that they are low when compared with his, but much depends on the allowances made and the standard of speech aimed at. As it is obviously impossible to give figures which would cover every case, those quoted were intended only for general guidance. Speech transmission over longer distances could only be dealt with satisfactorily when details of a scheme were known.

**Your Contributor.**

### Charging for Idle Current.

In your issue No. 2,267 Mr. E. W. Dorey says that a sine meter would have to be fitted with some sort of ratchet mechanism, so that it might run backward for a leading power factor. This is not so. Since the meter integrates E.I. sin $\phi$ *d t*, it will naturally run backward if $\phi$ is negative.

Your correspondent also calls the tariff I described my tariff. This, too, is not correct; the tariff is one that has been adopted by a leading power company. I quite agree that this tariff is more severe on customers with very bad p.f. than the tariff he suggests, which is generally known under the name "Midland Tariff." He will find a discussion of the principle on which this tariff is based at the end of my book on "Electrical Engineering," and he will see that I am in favour of it because it is just to the supply company as well as to the consumer. The trouble is that this Midland

Tariff does not permit of rewarding a customer with a leading p.f. Mr. Dorey says that "a bonus for leading p.f. is unquestionably desirable." With a tariff based on the ratio of two cosines this policy can easily be applied; will he make a suggestion how it can be applied under the Midland Tariff?

**Gisbert Kapp.**

Birmingham.
*May 9th*, 1921.

---

I have read with interest the letters of Prof. Kapp and Mr. E. W. Dorey, following on the article by Mr. Carrothers in your issue No. 2,262.

I agree with Mr. Dorey that a two-part charge, whether based on kVA or kW demand, is sound in principle. The running charge only should be altered in proportion to the power factor, on a scale similar to that proposed by Prof. Kapp.

This can quite satisfactorily be accomplished by the insertion of an ordinary 3-phase meter in series with the main meter, but connected with the "slow" phase reversed. The average power factor of the three-phase load over any period can then be found from the well-known formula $\tan \phi = \sqrt{3}\,\frac{W_1 - W_2}{W_1 + W_2}$, the main meter giving $W_1 + W_2$ and the reversed meter giving $W_1 - W_2$. This method has the merit of requiring ordinary meters only, and any slight inaccuracy of the meter due to reversal of the "slow" element will not be serious, as the charge based on it will be a very small proportion of the total charge in ordinary cases.

I have used this method with success both from my own and the consumers' point of view, and have made a scale on my slide-rule which gives $\cos \phi$ direct from the ratio $W_1 / W_2$ ($W_1 / -W_2$ where $\cos \phi$ is below 0.5).

If leading power factors are anticipated, then the "fast" element of the meter can be reversed to give a positive integration on the meter.

**J. D. Watson.**

Aberdeen.
*May 8th*, 1921.

---

### The Maintenance of Intercommunication Telephones.

I am one of those extraordinary persons who find pleasure in shouldering contractors' troubles with intercommunicating telephones, by taking their systems over in their name and maintaining them at a contract price. It would be interesting to know if there is another firm that has built a successful business in this branch alone of the electrical trade.

The average wireman not being conversant with the internal circuit of the intercom. 'phones and switchboard, finds it difficult to locate a fault; with this on the contractors' minds, I had a pleasant reception from them.

**The B.E. Co.**
G. Theobald.

London.
*May 7th*, 1921.

---

### Transformers and Changed Frequency.

Your reply almost solves "Kilowatt's" problem, by saying: "If the frequency is halved the flux is doubled"; but the voltage ratio would probably change a good deal if the transformer were not liberally designed for iron.

On half-rated frequency, in order to double the flux in a saturated core, an enormous magnetising current would be necessary. Then owing to the large R.I. drop, only a much diminished e.m.f. is available for transformation.

**H. Howwitz.**

London.
*May 7th*, 1921.

[We avoided details in our reply, for the sake of brevity, and dealt only with the broad principles, using the words "roughly speaking" advisedly. In practice the iron losses would be seriously increased on the lower frequency.—Eds. Elec. Rev.]

---

### A Peculiar Phenomenon.

In your issue of April 29th, Mr. James A. Lang states as follows: "Notably in the X-ray tube, where green rays are given off at the same time as the X-ray."

In 1915 I was doing a large amount of X-ray work, and was using Muller's tubes. The green light (or rays) was given off as stated in Mr. Lang's letter. However, when Muller's tubes could not be obtained, I was supplied with tubes which, I believe, were of British make. On using the latter tubes the light (or rays) was distinctly of a bluish colour.

I should be pleased if any reader of the Electrical Review could give me the theory of this difference in the colour of the visible light, in two different X-ray tubes. My theory is that the type of glass of which the tube is made is responsible; but why?

**H. E.**

Halifax.
*May 4th*, 1921.

### Cables for Hot Situations.

I should be pleased if you or any of your readers would advise me of the best cable to use to stand a temperature of not less than 105 deg. F. dry air (sometimes considerably more). Permanence is essential.

**R. A. H.**

---

### Water-tube Boilers.

With further reference to Mr. Cauthery's article on water-tube boilers in the Electrical Review dated April 1st, and the letter from Mr. A. Murray, our experience is that it is not safe to exceed one half a 1/32nd density for water-tube boilers, as we have found serious troubles to be experienced if this density is much exceeded, due to priming and pitting or corrosion of the tubes. The chemical action on the steel plates is greatly increased at high densities. As regards blowing down to reduce density, of course if the feed water is so pure that at the end of the run and when the boiler is due for cleaning, the density of the boiler water does not exceed the limit above mentioned, then there is no necessity to blow down at all; but as soon as the limit of density is reached, sufficient water should be blown out daily so that no further concentration takes place. If the make-up water is suitably softened, no appreciable scale will be deposited. We do not of course imply that the density above mentioned should be maintained by blowing out, with a leaky condenser. The only remedy is to repair the condenser as soon as possible. Serious damage may, however, be done to the boiler before the leakage is noted.

We know of a number of electricity stations where the boiler water is not allowed to exceed one quarter of a 1/32nd density, as they find from practical experience that this gives the best results. We are putting on the market a densimeter gauge for indicating the density of boiler water continuously. This does away with salinometer tests, and is a reliable safeguard against overheating due to excessive density. This gauge is recommended by all the boiler insurance companies.

**Porter Water Softening Co.**
W. H. Porter.

Flixton, Manchester.
*May 9th*, 1921.

---

### Dynamic and Potentiometer Control for Cranes.

I should be pleased to hear the views of any of your readers on their experience of the electrical control of the hoisting motion of electric cranes.

Several of the leading controller firms are favouring a system of plain series hoisting and dynamic or potentiometer control for lowering depending upon the load on the hook. It is in connection with the lowering side when using a drum reversing controller and having no mechanical braking that I desire information.

It would appear that to lower the hook light (no load) a current equal to full-load hoisting is taken from the line on the first notch and 50 per cent. full-load current on the last notch, also full-load current is taken from the line with half and full loads, but in the case of half load about 10 per cent. current is taken from the line on the last notch, and current is generated back into the line to the extent of 20 per cent. on the last notch with full-load lowering.

The speed of lowering is interesting. With no load the speed on the last notch is 140 per cent. (approximate), and at full load the speed is 170 per cent. (approximate) of the full-load hoisting speeds.

The arrangement of the circuit when lowering is that of a shunt motor, and the speed is determined by the values of resistance in the branches. I should be pleased to hear how these values are fixed and what would be the effect of varying the resistance in the field and armature (1) when the motor is being driven down (no load) and (2) when the load is driving the motor (¼ to full load). With contactor equipments, I understand, load discriminators are fitted.

**Drum Control.**

*May 8th*, 1921.

---

**Mme. Curie's American Visit.**—Mme. Curie has left Paris for the U.S.A., where she is to receive a gift of one gramme of radium, valued at £32,000. According to *Science*, the following societies have appointed committees to arrange for the reception of Mme. Curie: The American Chemical Society, American Electrochemical Society, American Sections of the Société de Chimie Industrielle, and the Society of Chemical Industry, and the Chemists' Club of New York City. A luncheon is to be given in her honour at the Hotel Waldorf Astoria on May 17th, and President Harding, in subscribing 50 dollars to the Madame Curie Radium Fund, wrote: "I am so anxious about the success of the programme to present to this distinguished woman a gramme of radium that I would like to have a small part toward making the necessary provision."

## NEW PATENTS APPLIED FOR, 1921.

**(NOT YET PUBLISHED.)**

**Compiled expressly for this journal by Messrs. Sexton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.**

11,560. "Electro-magnetic switches or contactors." Metropolitan-Vickers Electrical Co., Ltd. April 21st. (United States, April 23rd, 1920.)
11,562. "Lead for arc lamps." W. H. Argill. April 21st.
11,565. "Electric irons." H. H. Berry and W. J. Markham. April 21st.
11,568. "Electric cooking devices." S. Knevkosky. April 21st. (Czecho-Slovakia, May 14th, 1920.)
11,569. "Tuned high-frequency amplifiers for radio-telegraphy." C. T. Hughes. April 21st.
11,599. "Electric devices for heating fluids." E. A. Dinmore. April 21st.
11,602. "Magnetos." A. Christmas. April 22nd.
11,619. "Transmitting apparatus for automatic telephones, &c." A. Lambot. April 22nd.
11,647. "Electrical show-case and advertisement holder combined." E. E. Bayley and H. McReynolds. April 22nd.
11,660. "Slipper trolley heads for electric traction." Brecknell, Munro and Rogers, Ltd., and H. L. Rogers. April 22nd.
11,666. "Electric heaters." W. Hayhurst. April 22nd.
11,667. "Electric current transformers." Ferranti, Ltd., and A. H. Higgs. April 22nd.
11,668. "Sparking plugs." T. J. Puplett. April 22nd.
11,673. "Amplifier for electric circuits." Soc. des Telegraphes Multiplex (Systeme E. Mercandier, H. Magunna). April 22nd. (France, April 24th, 1920.)
11,679. "Electric arc lamps." S. B. Ausas. April 22nd.
11,682. "Protective devices." British Thomson-Houston Co., Ltd., and A. S. FitzGerald. April 22nd.
11,700 "High-frequency telephony." R. B. Ransford (Naamlooze Vennootschap Nederlandsche Radio Industrie). April 22nd.
11,732. "Electrodes for resistance welding processes." R. F. Woodburn. April 23rd.
11,782. "Means for controlling or regulating electric arc lamps, voltage regulators, &c." F. M. Lewis. April 23rd.
11,783. "Vacuum electric discharge tubes." E. C. R. Marks (Siemens and Halske Akt.-Ges.). April 23rd.
11,799. "Method of compressing water for power purposes and generating electricity." J. Worthington. April 25th.
11,807. "Electrical distribution fuse boards, fuse boxes, &c." W. L. Barber and Midland Electric Manufacturing Co., Ltd. April 25th.
11,815. "Electric lamps." W. E. Bladon. April 25th.
11,817. "Electric connections." E. P. Hall. April 25th.
11,821. "Accumulator charging board." G. A. H. Wootton. April 25th.
11,829. "Method of manufacture of laminated magnetic masses with cooling vanes for electric machines." P. Ehrmann. April 25th. (France, April 4th, 1919.)
11,833. "Combined oil indicators and ignition switches for internal combustion engines." A. E. Eyles and K. Rotherham. April 25th.
11,837. "Insulated electric wires, &c." Callender's Cable & Construction Co., Ltd., L. V. Gibson, and M. A. S. Warburg. April 25th.
11,844. "Electric contactor controllers." R. F. Baerlocher. April 25th.
11,857. "Dynamo-electric machines." G. A. Juhlin and Metropolitan-Vickers Electrical Co., Ltd. April 25th.
11,863. "Measurement of temperature by electrical resistance thermometers." C. E. Foster. April 25th.
11,865. "Device for dimming electric head lamps on motor cars." C. Killelea and Vandys, Ltd. April 25th.
11,874. "Search lights or head lights." H. Breitbart and Pallas-Zenith Ges. April 25th.
11,877. "Means for heating filaments of thermionic devices." Ges für Drahtlose Telegraphie. April 25th. (Germany, April 27th, 1920.)
11,890. "Electric heating." A. H. Pehrson. April 25th. (Sweden, April 26th, 1920.)
11,907. "Electrically-heated kettles, &c." W. W. Soutter and W. Soutter and Sons, Ltd. April 26th.
11,911. "Primary and secondary batteries." J. T. Niblett. April 26th.
11,920. "Flexible electric conductor." G. Marshman. April 26th.
11,932. "Method of operating discharge tubes or electric gas lamps with glow discharge." F. Skaupy and Studien Ges. für Elektrische Beleuchtung. April 26th.
11,934. "Commutator or ignition timer for motor cars." H. L. Pitt. April 26th.
11,943. "Electric burglar alarms." G. Kirk. April 26th.
11,945. "Electrically-heated vaporiser for internal combustion engines." F. J. Reed and J. S. Reed. April 26th.
11,955. "Electro-magnetic machines." E. S. Carey. April 26th.
11,966. "Electric power-transmission and braking systems." British Thomson-Houston Co., Ltd. (General Electric Co.). April 26th.
11,981. "Electro-pneumatic relays for organs, &c." J. H. Compton. April 26th.
12,005. "Means for mounting and driving magneto-electric machines on motor vehicles." A. M. Allen and R. B. North. April 26th.
12,008. "Rotors of turbo-alternators." Brush Electrical Engineering Co., Ltd., and C. C. Sutton. April 26th.
12,009. "Electric lighters for cigars, &c." A. Zecchini. April 26th. (Italy, April 26th, 1920.)
12,010 "Plug box for electric installations." W. Sack. April 26th. (Germany, May 21st, 1920.)
12,014. "Ventilation and cooling of electrical machines." H. C. E. Jacoby. April 26th.
12,015. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. April 26th. (United States, April 26th, 1920.)
12,023. "Combined ignition and lighting magneto generators." J. Bradley and Villiers Engineering Co., Ltd. April 27th.
12,047. "Electrical transformer tanks having oil bath, &c." Ateliers de Constructions Electriques de Charleroi Soc. Anon. April 27th. (Belgium, October 20th, 1920.)
12,051. "Electric connectors." E. W. Patterson (Dictograph Products Corporation). April 27th.
12,052. "Cable supports." E. W. Patterson (Dictograph Products Corporation). April 27th.
12,059. "Electrically-operated warning signals." D. McGregor. April 27th.
12,071. "Electric sewing machine cabinet." W. Fairweather (Singer Manufacturing Co.). April 27th.
12,076. "Means to prevent use of telephones." C. Monk and H. Yallop. April 27th.
12,105. "Telegraph systems." Western Electric Co., Ltd. April 27th. (United States, April 27th, 1920.)
12,114. "Electric resistance welding." F. A. Cramer and H. Marryat. April 27th.
12,124. "Reflectors for searchlights, &c." X. Bullinger. April 27th. (Germany, May 21st, 1920.)
12,125. "Electric lighters for cigars, &c." A. Zecchini. April 27th.
12,131. "Speed controlling devices for railway, tramway, &c., trains." E. Rodolausse. April 27th. (France, April 27th, 1920.)
12,137. "Telephony." C. E. Prince and S. Turner. April 27th.
12,138. "High-frequency telephone systems." Ges. für Drahtlose Telegraphie. April 27th. (Germany, May 20th, 1920.)
12,140. "Electric heaters." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). April 27th.
12,143. "Sound amplifiers for talking machines, and manufacture of same." A. Benoit, H. H. Duchesne, and J. L. Mathieu. April 27th.
12,145. "Rheostats." Metropolitan-Vickers Electrical Co., Ltd., and N. E. North. April 27th.
12,148. "Static frequency changers." Ges. für Drahtlose Telegraphie and M. Osnos. April 27th.
12,154. "Laying electric wires in conduits, &c." L. Greger and F. Zachhuber. April 27th. (Germany, November 10th, 1920.)
12,170. "Electric mercury vapour lamps." A. Cohen. April 28th.
12,181. "Electric welding." W. Langdon-Davies and A. Soames. April 28th.
12,187. "Electric terminal couplings." W. J. Polyblank. April 28th.
12,197. "Thermal switches." W. R. Barker and S. G. Jones. April 28th.
12,211. "Electric light shades or reflectors." F. Noke. April 28th.
12,213. "Sound amplifiers for gramophones, &c." T. W. Price. April 28th.
12,224. "Electrically-operated signal." J. H. Combs. April 28th.
12,227. "Protective devices for polyphase electric currents." N. G. Langrish and Metropolitan-Vickers Electrical Co., Ltd. April 28th.
12,231. "Pendant chains for electroliers, &c." F. C. Shrimpton and G. S. Shrimpton. April 28th.
12,238. "Method of mounting terminals of electric heating elements, &c." Electric Fires, Ltd., F. L. Newhouse, and C. H. Smith. April 28th.
12,249. "Cord grip holders for electric wires." J. Y. Fletcher. April 28th.
12,258. "Cases for electrical apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). April 28th.
12,270. "Electric switches." Metallurgique Electrique. April 28th. (France, October 29th, 1920.)

## PUBLISHED SPECIFICATIONS.

**The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.**

### 1914.

12,157. "Electric gasfilled glow discharge lamps." Lederer. May 19th, 1913.

### 1919

23,700. "Distribution connected with single-phase alternating current systems." A. M. Taylor. September 26th, 1919. (Cognate application 2,858/20.) (161,602.)
24,480. "Electrically-heated melting and other furnaces." Morgan Crucible Co., Ltd., and C. W. Speirs. October 7th, 1919. (161,603.)
25,052. "Electric furnaces." M. R. Trembour. March 24th, 1916. (133,954.)
25,088. "Electric rail and other metal body bonds and like connecting devices." British Insulated & Helsby Cables, Ltd., and J. W. Astley. October 14th, 1919. (161,607.)
28,844. "Wireless transmission of sound." E. C. Hanson. September 7th, 1915. (135,504.)
29,723. "Electric discharge apparatus." Western Electric Co., Ltd. (Western Electric, Inc.). November 28th, 1919. (161,619.)

### 1920.

793. "Electro-magnetic clocks." B. M. M. Moulin (née Chenard) and M. P. Favre-Bulle. January 9th, 1920. (161,650.)
809. "Wireless telegraph calling devices." W. H. Nottage and T. D. Parkin. January 9th, 1920. (161,652.)
878. "Electric plug connecting appliances." T. W. Jefferson and T. W. Jefferson, Ltd. January 10th, 1920. (161,659.)
887. "Electric switches and like apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). January 10th, 1920. (161,661.)
1,007. "Wireless direction-finding means for aircraft." H. R. G. van de Velde and J. M. Furnival. January 12th, 1920. (161,667.)
1,386. "Electrical condensers." Firm of R. Bosch. March 15th, 1915. (137,856.)
1,474. "Magnetos." N. C. F. Jenson and M. J. E. Tilney. January 16th, 1920. (161,696.)
1,612. "Construction of electric fire." H. J. Dean-Osgood. January 19th, 1920. (161,703.)
1,627. "Circuits of ignition systems of internal combustion engines." M. S. Conner and C. C. Puckette. January 19th, 1920. (161,704.)
1,635. "Electrical method of reproducing distant scenes visually." B. F. S. Baden-Powell. January 19th, 1920. (Cognate application 23,133/20.) (161,706.)
1,650. "Electrically-operated pumps." Merryweather & Sons, Ltd., J. H. Osborne, and C. H. Bown. January 19th, 1920. (161,707.)
1,714. "Magnetos." J. H. Tournayre. June 28th, 1919. (Patent of addition not granted.) (146,921.)
2,061. "Spark plugs." F. Hachmann. January 22nd, 1920. (161,720.)
3,156. "Electric fires." H. H. Berry. February 2nd, 1920. (161,745.)
3,168. "Submarine telegraphy." K. C. Cox. February 2nd, 1920. (161,746.)
3,186. "Electric induction apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). February 2nd, 1920. (161,748.)
3,270. "Methods of constructing electric resistance grids." C. E. Ogden. March 21st, 1919. (140,753.)
3,471. "Regulating systems for electric circuits." British Thomson-Houston Co., Ltd. (General Electric Co.). February 4th, 1920. (161,755.)
3,567. "Dynamo-electric generators for use in motor vehicles and like lighting and ignition systems." E. A. Watson and C. L. I. Manufacturing Co., Ltd. February 5th, 1920. (161,758.)
4,078. "Electric lamps." A. Konieczny. February 10th, 1920. (161,768.)
4,560. "Tramway rail beds." H. M. Dugeon and A. C. Baker. February 14th, 1920. (161,775.)
6,638. "Electric switch devices for preventing unauthorised starting and running of internal combustion engines." L. S. Crabb. March 4th, 1920. (161,798.)
7,147. "Electric storage batteries or accumulators." G. R. N. Minchin and Pritchett and Gold and Electrical Power Storage Co., Ltd. March 8th, 1920. (161,804.)
7,523. "Switches for electric signalling systems and like uses." R. Blunt and H. F. Mitchell. March 13th, 1920. (161,806.)
8,316. "Spark plugs." O. A. Stahl. March 20th, 1920. (161,812.)
8,421. "Apparatus for electric welding and cutting." J. A. V. Morse. March 22nd, 1920. (161,815.)
9,616. "Electrical resistance apparatus." C. J. Margerison and F. J. Shenton & Co., Ltd. April 6th, 1920. (161,827.)
9,809. "Sparking plugs for internal combustion engines." T. B. Broad and S. J. Plumber. April 8th, 1920. (161,828.)
13,517. "Means for detecting and indicating defective sparking plugs in the ignition systems of internal combustion engines." S. le F. Varvel. May 17th, 1920. (161,852.)
14,290. "Electrical systems containing X-ray or like apparatus." H. Pilon. August 19th, 1915. (143,860.)
15,912. "Trolley heads for overhead electric traction." H. George. June 12th, 1920. (161,866.)
16,630. "Commutators for dynamo-electric machines." Siemens-Schuckertwerke Ges. June 27th, 1914. (145,467.)
18,153. "Electric amplifying devices such as thermionic valves." Siemens and Halske Akt.-Ges. October 25th, 1916. (145,777.)
19,814. "Armature cores for dynamo-electric machines." V. G. Apple. March 8th, 1918. (147,786.)
20,405. "Electrodes for electric searchlights." Optische Anstalt C. P. Goerz Akt.-Ges. September 24th, 1918. (148,450.)
23,183. "Magnetos having rotating armatures." Fabriques des Montres Zenith. November 6th, 1919. (155,562.)
29,780. "Electric furnaces." E. L. Smalley. October 21st, 1919. (152,686.)